World Petroleum

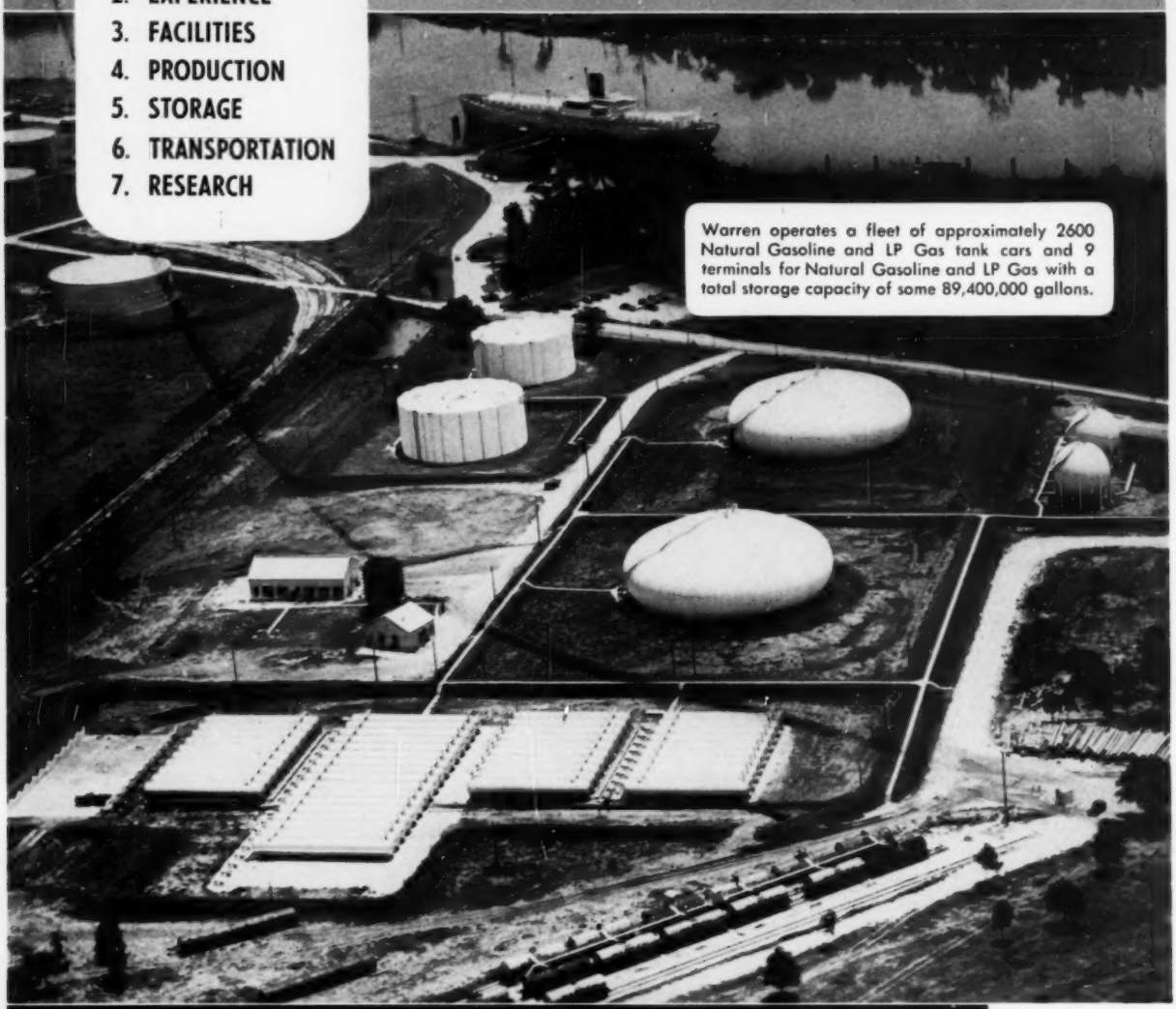
FIVE DOLLARS PER YEAR

SEPTEMBER, 1949

FIFTY CENTS PER COPY

7 Reasons WHY IT'S WARREN

1. PERSONNEL
2. EXPERIENCE
3. FACILITIES
4. PRODUCTION
5. STORAGE
6. TRANSPORTATION
7. RESEARCH



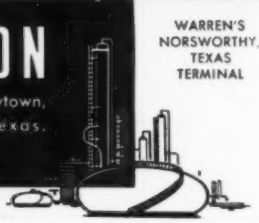
Warren operates a fleet of approximately 2600 Natural Gasoline and LP Gas tank cars and 9 terminals for Natural Gasoline and LP Gas with a total storage capacity of some 89,400,000 gallons.

WARREN PETROLEUM CORPORATION

Producers, Manufacturers, Exporters and Marketers

Export Terminals: Corpus Christi, Port Arthur, Baytown, Texas City, and Norsworthy, Houston, Texas.

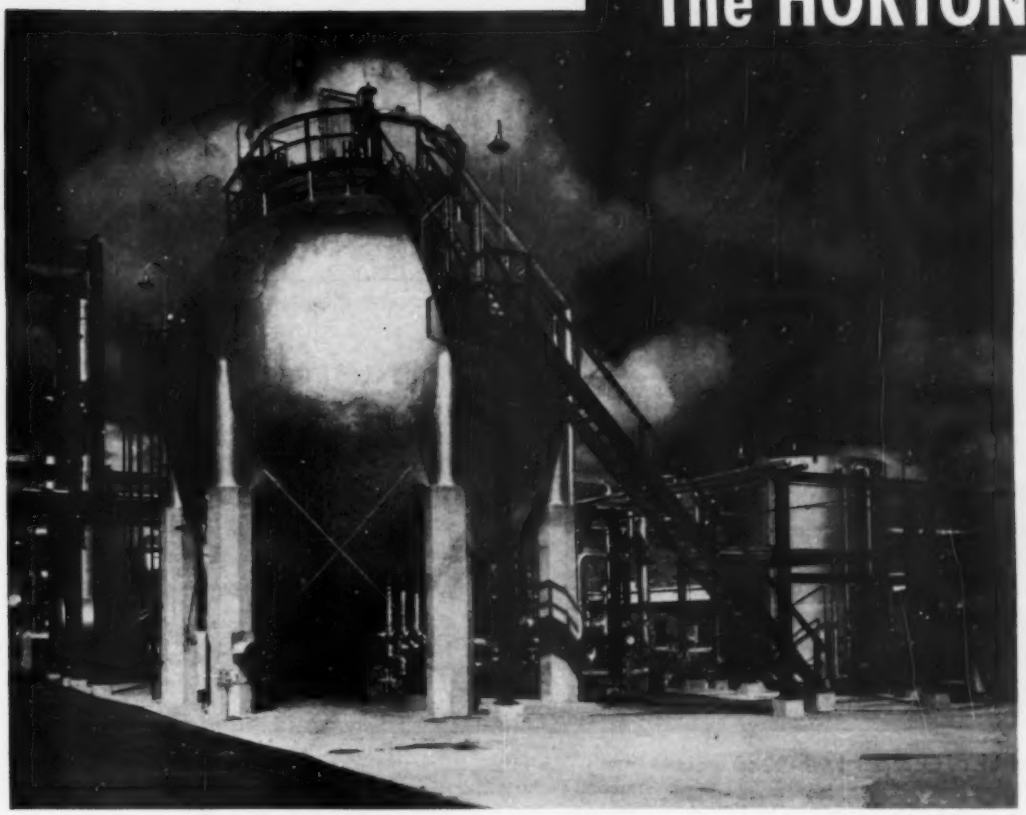
TULSA 2, OKLAHOMA CABLE ADDRESSES: Stavolene, Warren



WARREN'S NORSWORTHY, TEXAS TERMINAL

Crude Oil, Natural Gasoline and Liquefied Petroleum Products

The HORTONSPHERE



The 28-ft. diam. Hortonsphere shown at the left, is located at the Creole Petroleum Company's processing plant in the Mulata field in Venezuela. It desalts more than 20,000 bbls. of crude oil per day, reducing the salt content from 120 lbs. to 15 lbs. per 1,000 bbls.

to improve the crude, it removes the salt

In oil fields and at refineries, the versatile Hortonsphere is handling a novel and vital assignment in petroleum processing. It's cutting refining costs by removing most of the salt from the crude oil that has a high salt content.

When used as a desalter, the Hortonsphere is equipped with an electrical unit developed by the Petroleum Rectifying Company. The combination is called an Electrosphere.

Crude oil with a high salt content causes a serious reduction in the efficiency and output of refining units and necessitates shorter runs. In the desalting process, the salt-bearing crude charging stock is heated, mixed with water, and emulsified. The mixture then flows into the Electrosphere where it enters a high voltage electrical field. The water and brine particles are electrically attracted and coalesced, and the coalesced masses settle by gravity to the bottom of the sphere to be drawn off.

The Electrosphere is just one special application of the Hortonsphere. This efficient pressure vessel is well known in the petroleum industry for the storage and handling of such highly volatile products as natural gasoline, butane, and butane-propane mixtures. For full information, call or write our nearest office.

Advantages of Desalting

The electric desalting process removes approximately 90% of the salt from crude oil. This—

1. Reduces the salt accumulation in processing units.
2. Cuts down the corrosion from evolved HCL.
3. Keeps sand, silt, rust, and slugs of water from entering processing units with the crude.
4. Prevents formation of hard, flinty coke in furnace.

By using the Electrosphere, refineries are able to operate for longer periods with less down time. Heat exchange efficiency is increased and higher furnace temperatures can be used for deeper cracking.

CHICAGO BRIDGE & IRON COMPANY

Chicago • Houston • Tulsa • San Francisco • Birmingham • Atlanta • Cleveland • Philadelphia • Los Angeles • Salt Lake City • Boston • Seattle • Detroit
Plants: Birmingham, Chicago, Salt Lake City and Greenville, Pa., U.S.A. Export Office—165 Broadway Building, New York 6, N. Y., U.S.A.

REPRESENTATIVES AND LICENSEES

Ateliers et Chantiers de la Seine Maritime, Paris, France
Constructions Metalliques de Provence, Arles-sur-Rhone, France
Chicago Bridge & Iron Company, Ltd., Apartado 1348, Caracas, Venezuela
Compagnia Tecnica Industrie Petroli, S.A. I, Rome, Italy
Whessoe, Limited, Darlington, England
Motherwell Bridge & Engineering Company, Limited, Motherwell, Scotland
Horton Steel Works, Limited, Fort Erie, Ontario, Canada
W. P. Bryant, Edificio Abreu 402, Havana, Cuba

Bandwagon rolling for OIL PROGRESS WEEK!

During the week of October 16th-22nd, your community's attention will be focused on the oil industry! For that's the date of Oil Progress Week—the week that gives you a chance to report the progress you and your industry have made.

Last year, Oil Progress *Day* gave thousands of oil men across the country a great chance to tell their story—and they did, with results that paid off handsomely in good will and good business. This year, with an entire *week* devoted to the event, you've got an even greater opportunity to explain how your firm is helping to provide America with *better,* more efficient oil products ... higher standards of service.

You're the One Who Gains!

YOU gain when your customers understand the competition in oil—the way you compete with rival companies to win customer approval. For as the public learns what a great job you're doing, they'll understand why your business freedom means *more* oil products, *better* oil products, better service for *them!*

Hurry! Get Ready For Your Big Week!

Get free material to promote Oil Progress Week from your local committee office. You can adapt it to fit your needs. Tie in ads ... sample speeches ... booklets ... motion pictures ... employee meeting material ... poster designs ... radio material ... everything you need to make Oil Progress Week *your* week!

Here's how you can benefit from Oil Progress Week

During Oil Progress Week get people acquainted with your business. That way, your neighbors will get a new understanding of the problems you face ... an understanding that's *bound* to result in more friends for YOU! Tell them about today's new and better oil products ... how *hard* you've worked to maintain and step up your high standards of quality and service—and you create good will that pays off for *you* and *your firm* in the long run!

Get in touch with your district committee NOW!

They'll make it easy for you to make the most of Oil Progress Week. They'll give you material you can use to tie your business in with this big nation-wide report!

Get in touch with your local O.I.I.C. office NOW, or write to national office address listed below.

OIL INDUSTRY INFORMATION COMMITTEE
50 West 50th Street • New York 20, N. Y.

Don't miss this chance to stand out in your community! Make Oil Progress Week Your Week!

LOOK AT THIS THING—IT HOLDS A RARE SKILL

A vessel welded of two-inch aluminum was desirable for many processes before anyone could produce it. Only within the last two years was this skill mastered. Stacey Bros., a Dresser company in Cincinnati, pioneered in the welding of thick aluminum and, today, fabricates and welds up to 3½" plate. Whether the materials are aluminum, steel or steel alloys, Stacey Bros. can fabricate them for as difficult problems as can be solved anywhere.

The welded vessel shown has 1¼" walls with a second vessel inside having 2" walls. Stacey Bros. made it for McCarthy Chemical Co. This unique skill in welding resulted from two years' research with Battelle Institute. And from years more at Stacey Bros., including the invention of a new torch using a shield of argon gas.

The ownership of such unrivalled facilities, and such pioneering skills, is the reason why—The Biggest Jobs Are Going to Dresser. What problem have you in construction of large vessels? Write inquiries about large welded vessels and tanks to Dresser Industries, Inc., Terminal Tower, Cleveland, Ohio.

BOVAIRD & SEYFANG Mfg. Co.
Bradford, Pa.

CLARK Bros. Co., Inc.
Olean, New York

DRESSER Mfg. Division
Bradford, Pa.

DRESSER Mfg. Company, Limited
Toronto, Ont., Canada

INTERNATIONAL Derrick & Equipment Co.,
Beaumont & Dallas, Texas; Torrance, Calif.;
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PACIFIC Pumps, Inc.
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ROOTS-CONNERSVILLE Blower Corp.
Connersville, Ind.

SECURITY Engineering Co., Inc.
Whittier, Calif.

STACEY BROS. Gas Construction Co.
Cincinnati, Ohio
Stacey-Dresser Engineering Division
Cleveland, Ohio

THE ONLY COMPANY DOING AN OVER-ALL JOB—

From well to refinery
for the Oil Industry—
From source to consumer
for the Gas Industry

DRESSER INDUSTRIES, INC.
TERMINAL TOWER • CLEVELAND 13, OHIO

WORLD PETROLEUM September, Vol. 20, No. 10. WORLD PETROLEUM is published monthly by Mona Palmer, Trustee under the will of Russell Palmer, 2 West 15th St., New York 19, N. Y. Subscription price—$5.00 per year, single copies 50c. Acceptance at East Stroudsburg, Pa., under Section 34.64 P. L. and R. authorized.

Side-By-Side after 32 years

GREAT quantities of oil have gone through the pumps in the last 32 years--and there is a lot more to come. The above illustration shows a 10¾" line built in 1917 and its new companion 22" line in the Ozark system, terminating at Wood River, Ill. Line pipe for both these projects was furnished by Youngstown and we are proud to have played a part in the completion of the new as well as the old.

The Basin and Ozark system is the largest privately financed oil line ever constructed. Faith in the economic future of our country is represented by this venture. Many other pipe line projects under construction or contemplated reflect this same faith. In our present economy tomorrow's oil and tomorrow's gas are of increasing importance to all.

Youngstown line pipe means long lengths, ease of bending, ease of welding, speed in laying--the result of know-how developed in almost 50 years of pipe production. Remember, if it is Youngstown--it's good.

Youngstown

OIL COUNTRY TUBULAR GOODS and LINE PIPE

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Yoloy Steel

General Offices — Youngstown 1, Ohio

Export Office - 500 Fifth Avenue, New York

PIPE AND TUBULAR PRODUCTS - COLD FINISHED CARBON AND ALLOY BARS - ELECTROLYTIC TIN PLATE - COKE TIN PLATE - WIRE - CONDUIT - RODS - SHEETS - PLATES - BARS - RAILROAD TRACK SPIKES

The Ethyl Technical Man brings the refiner

26 YEARS OF RESEARCH EXPERIENCE

Twenty-six years of extensive fuel-engine research work at Ethyl have built up vast files of basic information on fuels and engines. These are being continuously expanded by the addition of results from current programs. Making this material useful to oil companies is the full-time work of a staff of Ethyl Technical Representatives.

The dual function of this group is:

1. **To interpret Ethyl's accumulated technical information in the light of each refiner's specific problems, as an aid to the economical production of satisfactory fuels for today's and tomorrow's automobile engines.**
2. **To keep the Ethyl Laboratories informed on the problems and technical interests of the oil companies as a guide to the formulation of Ethyl's research objectives and programs.**

The technical information in the files of the Laboratories covers a wide range of subjects related to the problems of refining gasoline. More important, however, than the knowledge accumulated on individual subjects is the understanding acquired of the many complicated interrelationships of engines, fuels, and lubricants.

Ethyl Technical Representatives have all had long experience in the Research Laboratories and have helped to develop the information which they now make available to refiners. All the extensive technical data kept in the Ethyl research files and all the results of current research programs are available to these technical representatives.

Because they are so thoroughly informed on Ethyl's research activities, they are of maximum help to refiners on problems related to the utilization of gasoline in engines. If a refiner's particular problem makes desirable a discussion between his specialists and Ethyl Research specialists in the same field, the Technical Representative is usually able to arrange such a meeting.

The wide experience of Ethyl Technical Representatives and their familiarity with Ethyl's research programs contribute to one of Ethyl's most important research objectives—

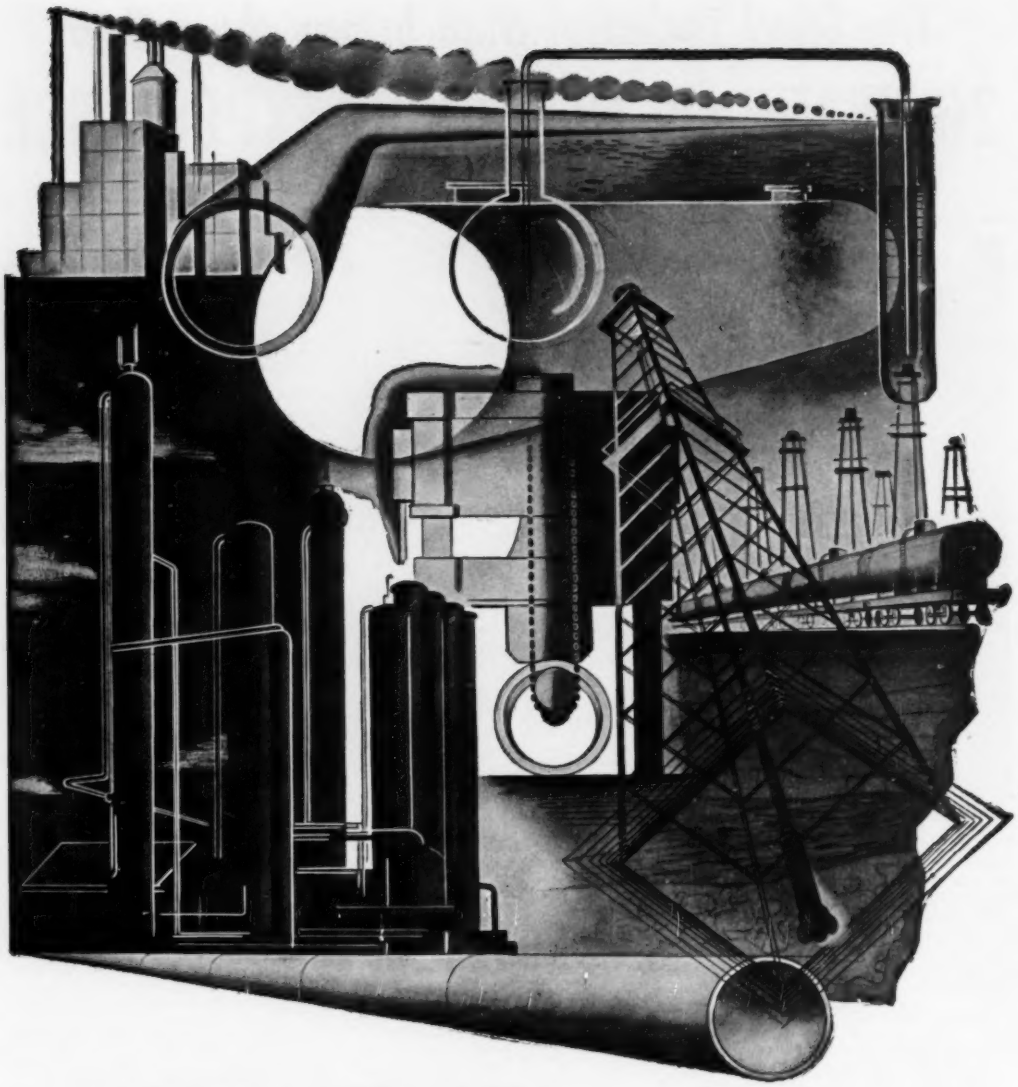
developing and distributing information to assist refiners in economically producing satisfactory gasoline.

Since 1923—*continuous research to provide better antiknock service*

ETHYL CORPORATION

RESEARCH LABORATORIES

Detroit, Michigan, 1600 West Eight Mile Road • San Bernardino, California, 2600 Cajon Road



STEELS FOR THE

PETROLEUM INDUSTRY

THE UNITED STEEL COMPANIES LTD

THE UNITED STEEL COMPANIES LIMITED

17 WESTBOURNE ROAD · SHEFFIELD 10 · ENGLAND

U.S. 31

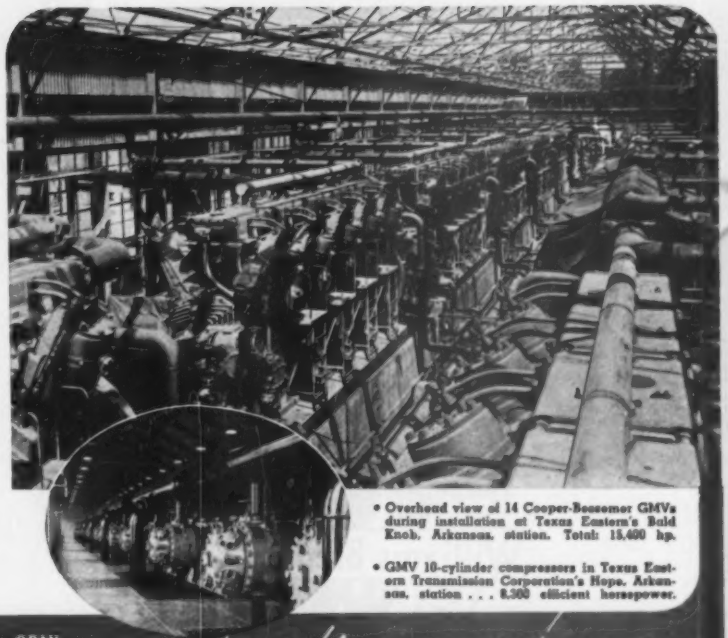
GMV Turboflow Saves Fuel For Big And Little Big Inch

As indicated on this map of the Inch line, 5 of the 7 new stations powered by reciprocating engine-driven compressors are GMV-equipped — a total of 46,900 Cooper-Bessemer V-angle hp.

Of particular significance, the GMVs most recently furnished (29 of the 44 now on the lines) are *Turboflows* — Cooper-Bessemer's latest gas-engine development, affording a full 10% increase in power output while reducing fuel consumption by at least 15%.

Today, more and more of the big gas lines are taking advantage of the new savings made possible by Cooper-Bessemer V-angle Turboflows. Unprecedented fuel economy and increased power output, obviously means big reductions in the overall costs of installation.

If your plans call for compressor horsepower, you'll find Cooper-Bessemer Turboflows to be your best bet on *every* score.



• Overhead view of 14 Cooper-Bessemer GMVs during installation at Texas Eastern's Bald Knob, Arkansas, station. Total: 15,400 hp.

• GMV 10-cylinder compressors in Texas Eastern Transmission Corporation's Hope, Arkansas, station . . . 8,300 efficient horsepower.

Another Example of Efficient Power at Lower Cost

ANGLE V

Compressors by Cooper-Bessemer

MOUNT VERNON, OHIO AND GROVE CITY, PENNA.

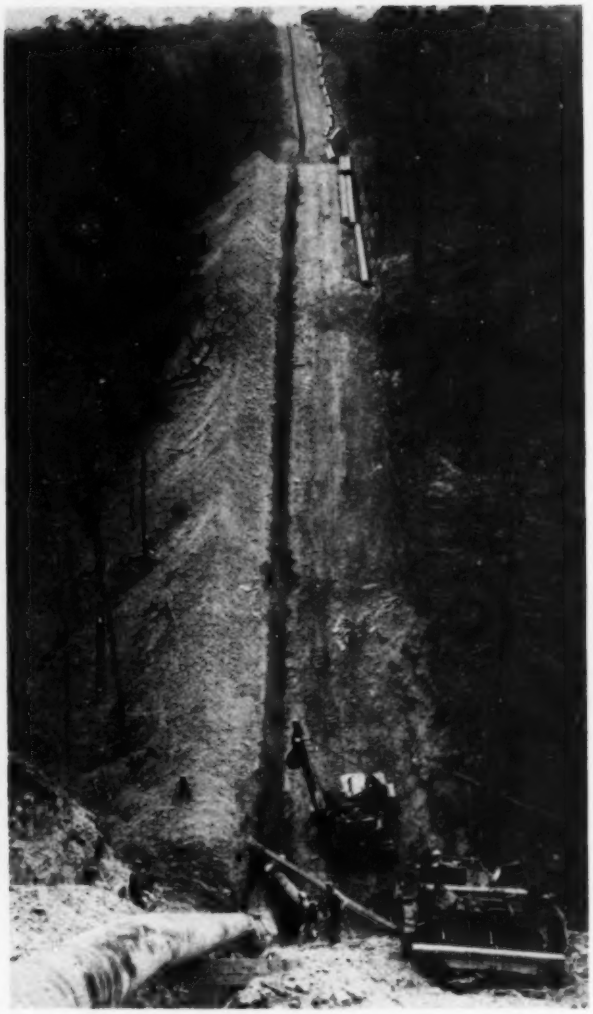
New York Washington Bradford, Pa. Parkersburg, W. Va. San Francisco, Cal. Seattle, Wash. Houston, Dallas, Greggton, Pampa and Odessa, Texas Tulsa Shreveport St. Louis Los Angeles

It's More than "Layin' Pipe!"

Pipe Line Construction is a Combination of...

- ENGINEERING SKILL
- ADEQUATE PERSONNEL
- EXPERIENCED CREWS
- MODERN EQUIPMENT
- CUSTOMER SATISFACTION

PIPE LINE ENGINEERS
Williams Brothers Corp.
CONTRACTORS



The successful construction of 35,000 miles of pipe lines on three continents in the past 34 years is proof of the unbeatable combination of skilled personnel and modern equipment that Williams Brothers maintain.

Williams Brothers will master the hazards of swamps, rivers, deserts and mountains to successfully complete your pipe line.

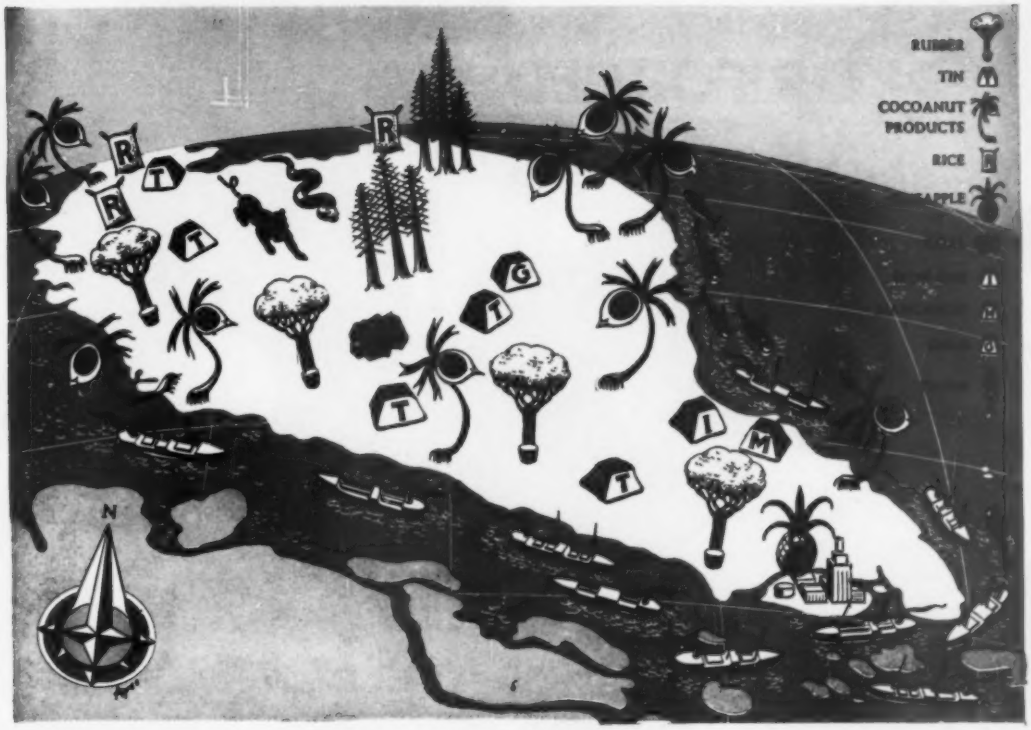
You'll find our trained engineers and specialists eager to assist you with your construction plans and you'll find Williams Brothers can serve you better.

WILLIAMS BROTHERS CORP.

ENGINEERS—CONTRACTORS

Oil • Gas • Gasoline • Water
Pipe Lines and Pump Stations

NEW YORK • TULSA • ATLANTA • HOUSTON



MALAYA

MALAYA . . . The tropical Malay peninsula and adjacent islands, comprising The Colony of Singapore and The Federation of Malaya, is amazingly colorful, enchanting, and productive. Its green jungle-clad mountains, rubber plantations and rich alluvial plains provide a large share of the world's rubber and tin; its natural wealth includes cocoanut products, rice, pineapple, timber, coal, iron ore, manganese and gold; its surrounding blue seas abound with fish. Living in friendly harmony with the hospitable Malays in this equatorial clime are Chinese, Indians, Burmese, Siamese, Indonesians and Occidentals from many countries.

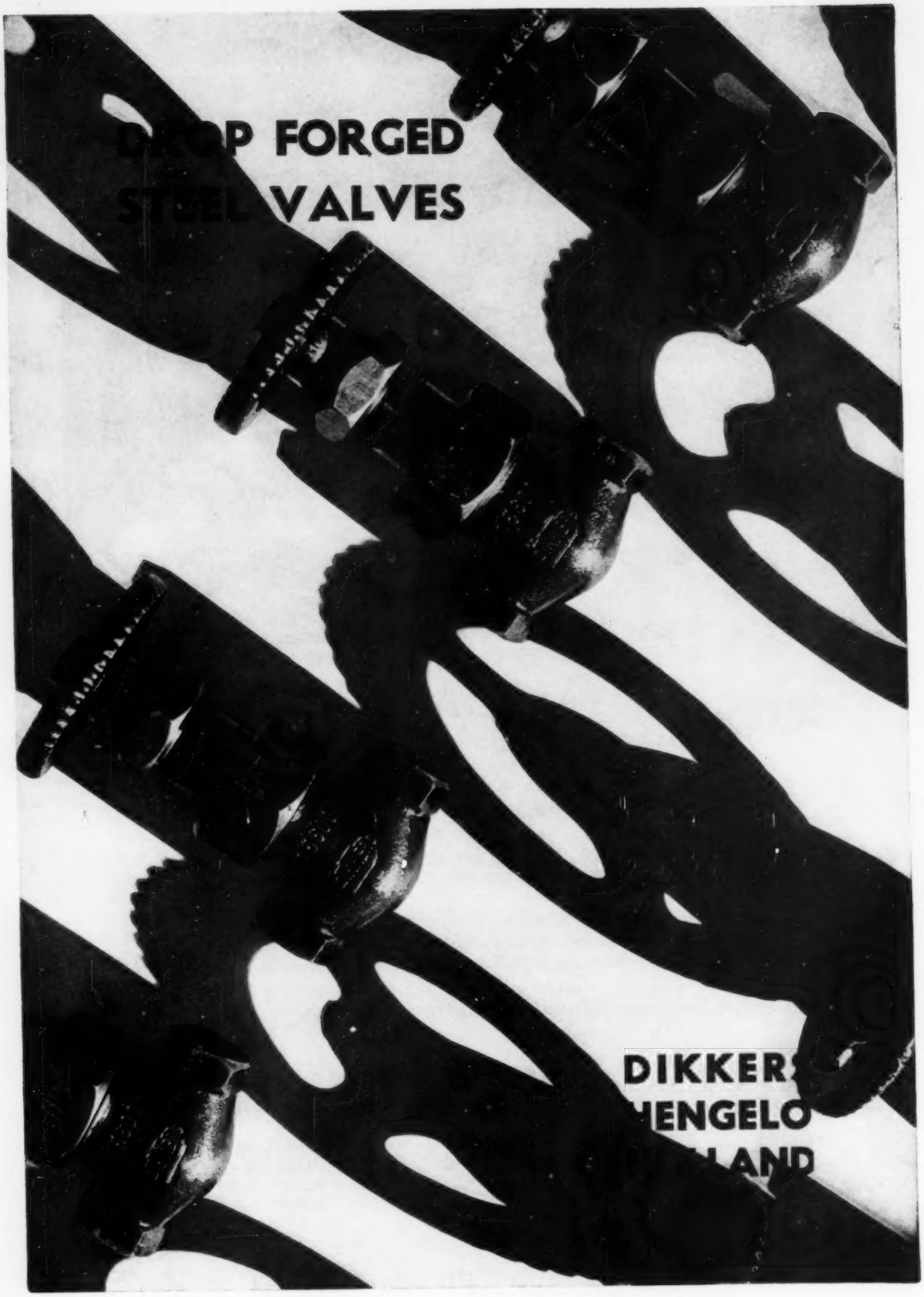
SINGAPORE, the focal point of the verdant peninsula, with its teeming harbor rated among the world's ten most important, is truly the "Crossroads of the East." Through this great clearing house of Southeast Asia flows commerce in endless variety.

STANDARD-VACUUM is proud of the part it plays in supplying Malaya with the petroleum products so essential to its welfare and continued growth.

STANDARD-VACUUM OIL COMPANY

26 BROADWAY, NEW YORK 4, N. Y.

AUSTRALIA • BURMA • CEYLON • CHINA • INDIA • INDO-CHINA • JAPAN • KENYA
MADAGASCAR • MALAYA • MAURITIUS • INDONESIA • NEW ZEALAND
PAKISTAN • PHILIPPINES • PORTUGUESE EAST AFRICA • RHODESIA • SIAM
SOUTH PACIFIC ISLANDS • SOUTH-WEST AFRICA • TANGANYIKA • UNION OF SOUTH AFRICA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VALVES
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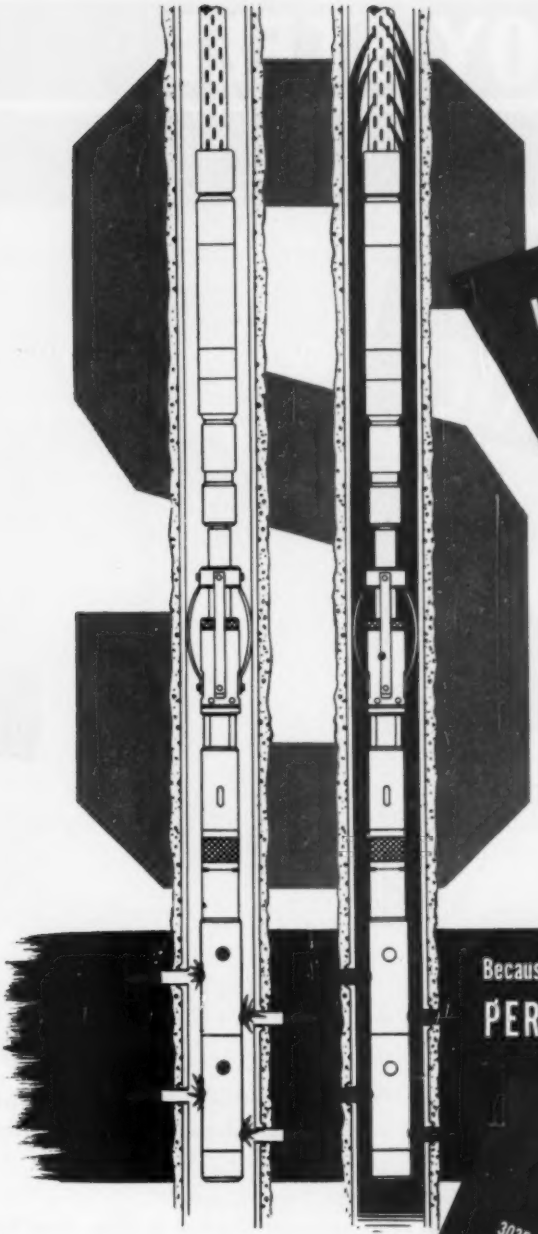


INTERESTED IN SAVINGS?

The combination of the Johnston "Shoot-N-Test" Gun Perforator and the Johnston Formation Tester

SHOOT-N-TEST

- Saves wear and tear on equipment
- Cuts many hours off completion time
- Gets wells on production faster

Because They

PERFORATE and TEST

IN A SINGLE RUN

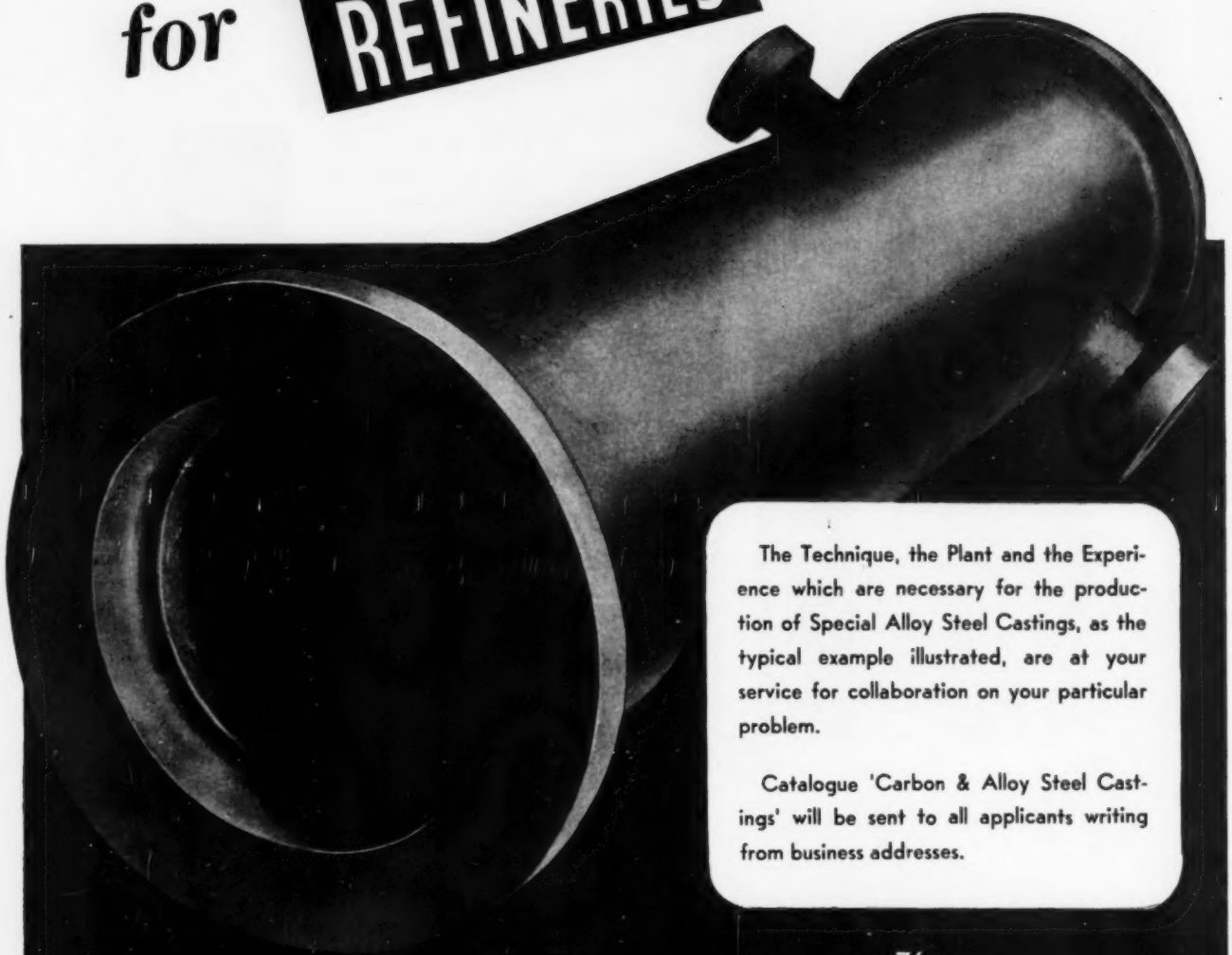
M. O. JOHNSTON
OIL FIELD EXPORT CORPORATION
EXPORT SALES
3035 Andrita St., Los Angeles 41, Calif., U. S. A.
CABLE ADDRESS "MOJOC"

The Johnston "Shoot-N-Test" Gun Perforator at moment of fire.

Following perforation formation fluid enters Johnston Tester Assembly.

CORROSION RESISTING AND SPECIAL ALLOY STEEL CASTINGS

for PETROLEUM REFINERIES

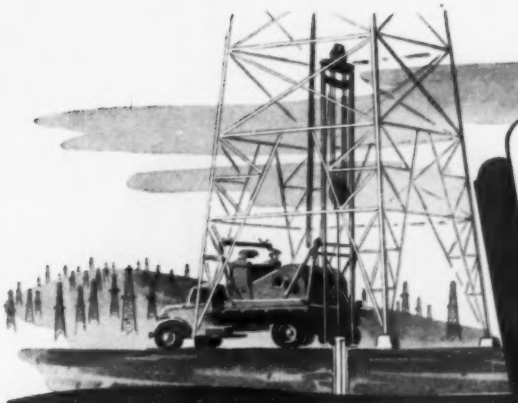


The Technique, the Plant and the Experience which are necessary for the production of Special Alloy Steel Castings, as the typical example illustrated, are at your service for collaboration on your particular problem.

Catalogue 'Carbon & Alloy Steel Castings' will be sent to all applicants writing from business addresses.

STAINLESS STEEL REFLUX COLUMN FOR HOT SO_2 DISTILLING PLANT IN 18/8/4 CHROMIUM-NICKEL-MOLYBDENUM STEEL WORKING PRESSURE 75 lb./sq. in HYDRAULIC TEST PRESSURE 150 lb./sq. in WORKING TEMPERATURE 250° F.

The
DAVID BROWN
FOUNDRIES COMPANY
PROPRIETORS: DAVID BROWN & SONS (HUDDERSFIELD) LTD
PENISTONE NEAR SHEFFIELD

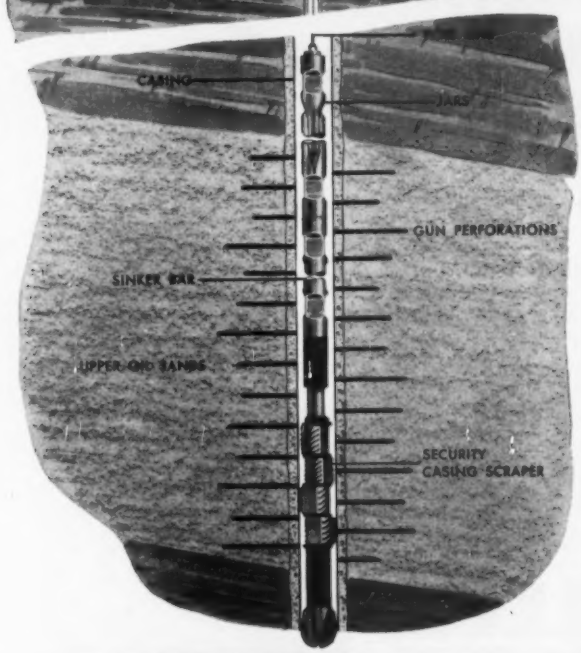


LOCATION: Signal Hill

WELL HISTORY: Depleted production required recompletion at upper pay zone. Gun perforated at 10,000 feet opposite new pay.

PROBLEM: Economically scrape casing perforations without rotary equipment.

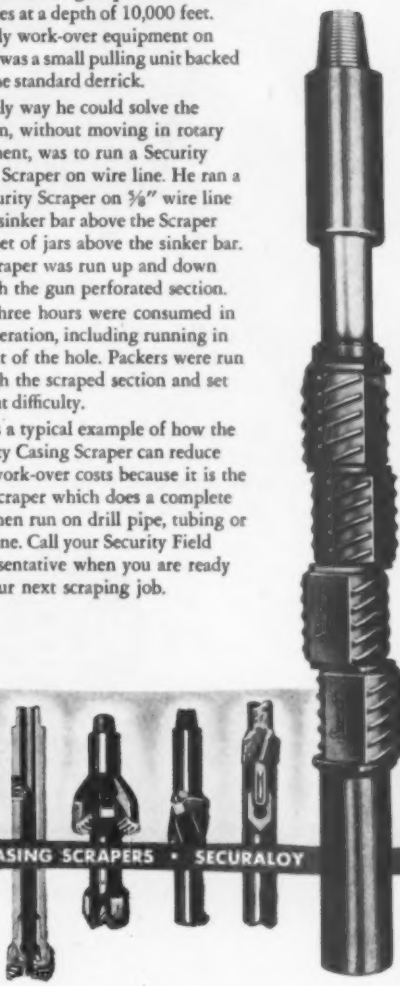
How would you Scrape Casing Without a Rotary?



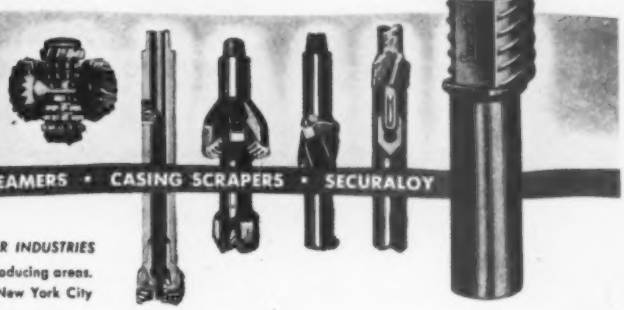
The production superintendent of a large oil company was faced with the problem of scraping 7" casing which had been gun perforated with 150 holes at a depth of 10,000 feet. The only work-over equipment on the job was a small pulling unit backed up to the standard derrick.

The only way he could solve the problem, without moving in rotary equipment, was to run a Security Casing Scraper on wire line. He ran a 7" Security Scraper on 5/16" wire line with a sinker bar above the Scraper and a set of jars above the sinker bar. The scraper was run up and down through the gun perforated section. Only three hours were consumed in this operation, including running in and out of the hole. Packers were run through the scraped section and set without difficulty.

This is a typical example of how the Security Casing Scraper can reduce your work-over costs because it is the only Scraper which does a complete job when run on drill pipe, tubing or wire line. Call your Security Field Representative when you are ready for your next scraping job.



Security



ROCK BITS • CORING BITS • HOLE OPENERS • REAMERS • CASING SCRAPERS • SECURALOY

SECURITY ENGINEERING CO., INC.

ONE OF THE DRESSER INDUSTRIES

Main Office and Plant: Whittier, Calif. Branches in all of the major producing areas.

Export Office: Chanin Building, New York City

● In what may have been the first American Commando raid, troops under General George Washington fell upon British forces at Trenton, N. J., December 26, 1776, following a surprise crossing of the icy, roiling Delaware River. George Washington knew the enemy would be celebrating the Yuletide and would be disorganized. That was *correct interpretation* that paid off.

Such expert interpretation is a matter of experience.

● Experience counts. This is especially true in seismic exploration, where McCollum Exploration Company has had leadership for over a quarter of a century. Years of experience in the seismic field are necessary for *accurate interpretation* of facts. All this is a matter of vital importance when it concerns costly drilling operations in the oil business.

McCOLLUM SINCE 1923
Exploration Company

403A EIGHTH AVENUE WEST, CALGARY, ALBERTA, CANADA

DOMESTIC AND FOREIGN EXPLORATION

Pioneers in

Refraction Shooting • Reflection Shooting • Well Shooting • Marine Shooting

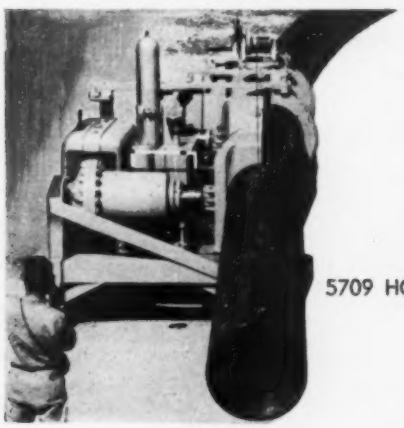
BENT SMOOTH AND FULL FORMED MAKING
CLEANING & PRIMING - DOPING & WRAPPING - A CONTINUOUS
ELIMINATES STOPPING MACHINES
ELIMINATES HAND TREATING
ELIMINATES STARTING

'Cinch' BENDER eliminates COSTLY 'KINKING'—

Gives the owner the pipe line he desires —

Gives the contractor better production methods and economy

The 'Cinch' Bender makes pipe bending a cinch . . .

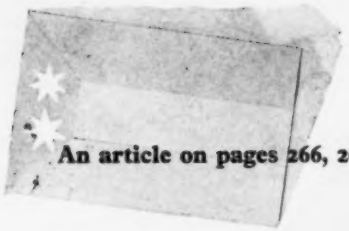


- CINCH SPEEDS UP PRODUCTION.
- CINCH REDUCES LABOR COSTS.
- CINCH ELIMINATES RISK IN BENDING.
- CINCH AFFORDS A CONTINUOUS OPERATION.

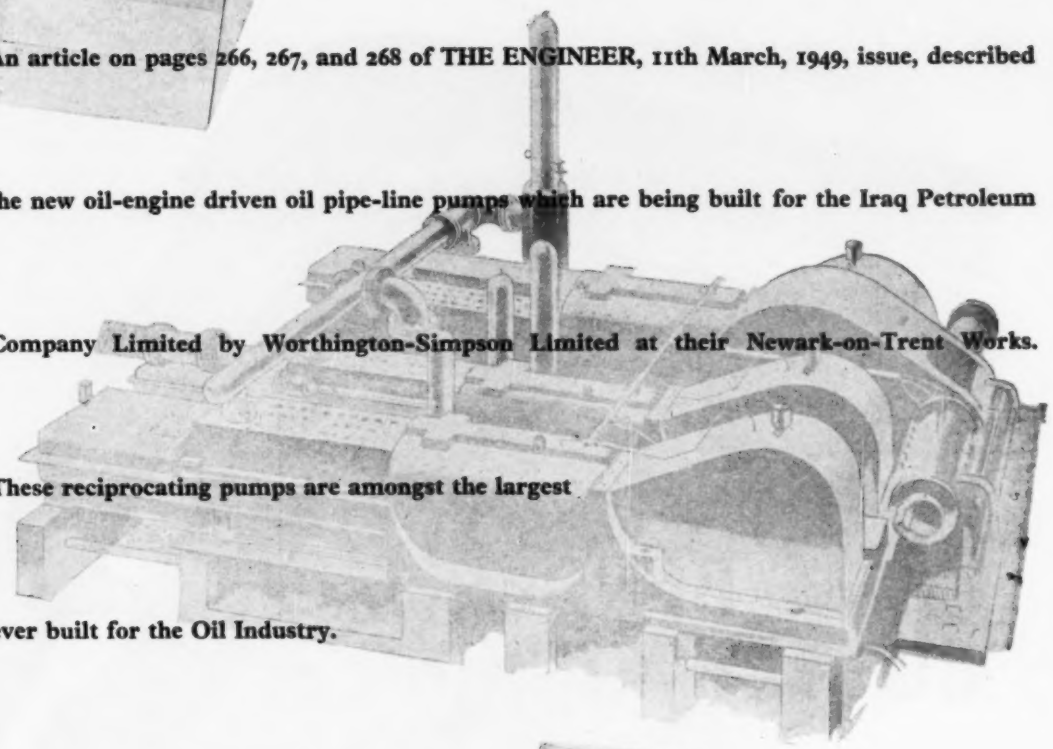
THE COODY BENDER COMPANY

5709 HOLMES ROAD P. O. BOX 9271, CENTRAL PARK STATION
PHONE YUKON 85441-2-3

HOUSTON, TEXAS

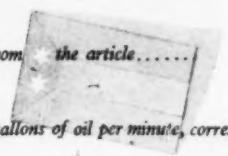


An article on pages 266, 267, and 268 of THE ENGINEER, 11th March, 1949, issue, described the new oil-engine driven oil pipe-line pumps which are being built for the Iraq Petroleum Company Limited by Worthington-Simpson Limited at their Newark-on-Trent Works.



These reciprocating pumps are amongst the largest ever built for the Oil Industry.

The performance of the pumps is described in this extract from the article.....



" The designed output of each pump is 1,200 gallons of oil per minute, corresponding to 50,000 barrels per day, delivered at a pressure of 1,000 lb. per square inch."

The glands of the pumps are packed with SUPERSEAL NO. 3 Plasti-Metallic Packing supplied in pre-compressed ring form.

SUPERSEAL is one of the finest gland service packings manufactured. Supplied in five standard forms:

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Send for a copy of our **Gland Service** *Recommendation Chart, now about to be published.*

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This 47' diameter 100 ton regenerator cone of a large fluid catalytic cracking unit (designed and now under construction by Foster Wheeler at Abadan, Iran) was lifted 160 feet into place—as planned.

It's all in the day's work —if you know how. Foster Wheeler's "know how" is the product of 30 years' experience in the design, engineering, fabrication and construction of over 500 petroleum processing units.

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fabrication

Welding the lower head of one of the larger aluminum towers of the Carthage-Hydroco Oxygen plant at the Carteret, N. J. shop.

Fabrication—in its own shops—of petroleum refining and chemical plant process equipment is one of the most important factors comprising the complete engineering and construction service that is Foster Wheeler.

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Complete fabrication facilities are available at four plants: FW *Carteret, N. J. Dansville, N. Y. St. Catherines Ont. and Egham, Surrey, England.*

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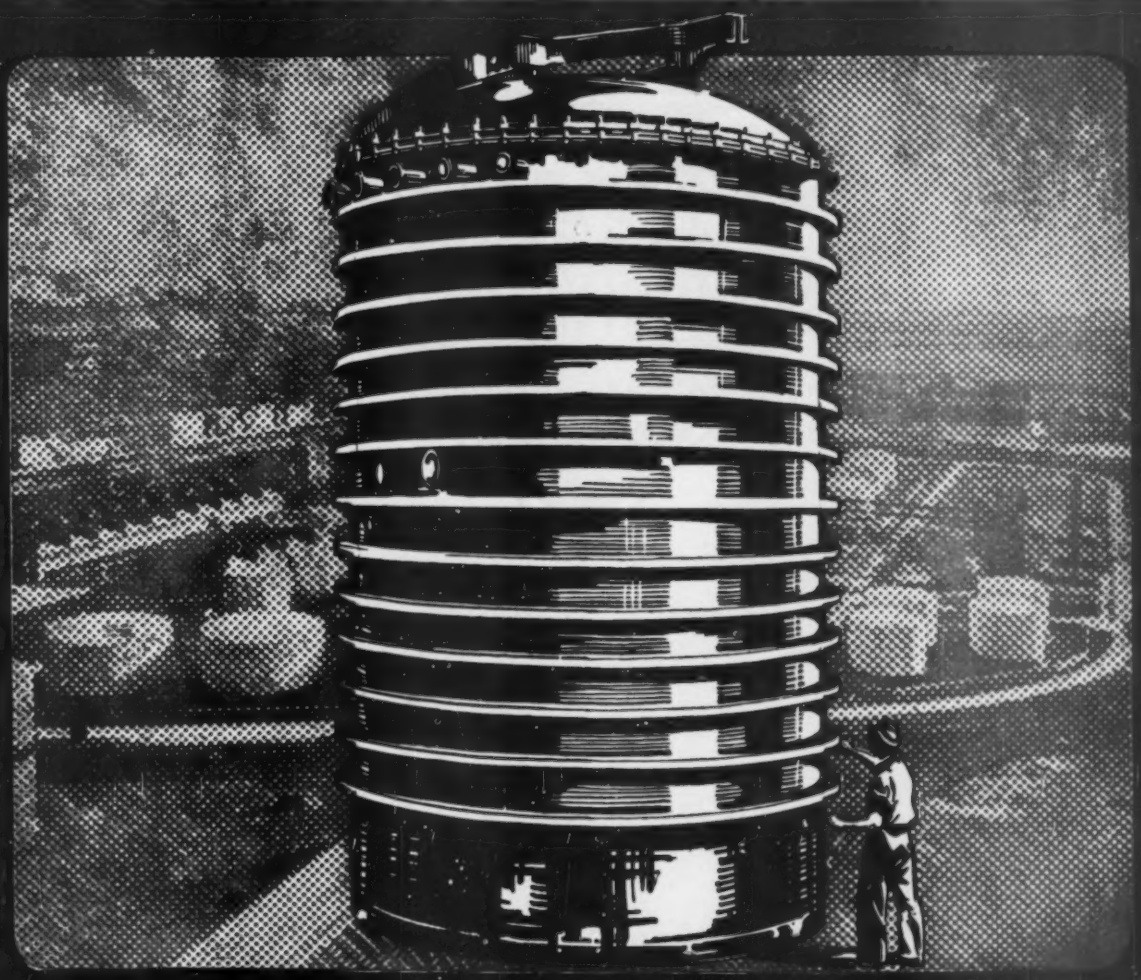

Because Harveys specialise in the fabrication of Pressure Vessels for the Industrial and Chemical Trades. Modern welding equipment, and an experienced staff are available for Pressure Vessel manufacture to any of the recognised codes, including A.O.T.C., Lloyds, A.P.I. and A.S.M.E. with if necessary, X-ray examination and stress relieving by heat treatment.

Harveys fabricate from mild or alloy steels, nickel and clad steel. Shop assemblies range from a few inches to 15' 0" in diameter, pressures from absolute to 3,000 lbs. per sq. in.

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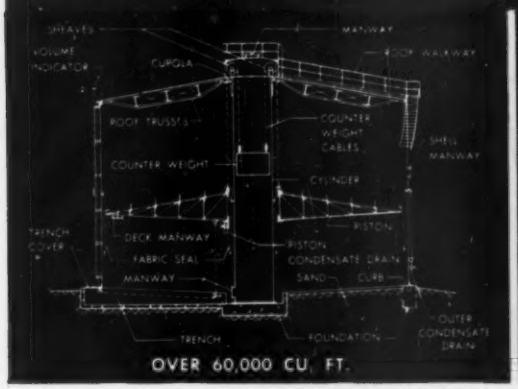
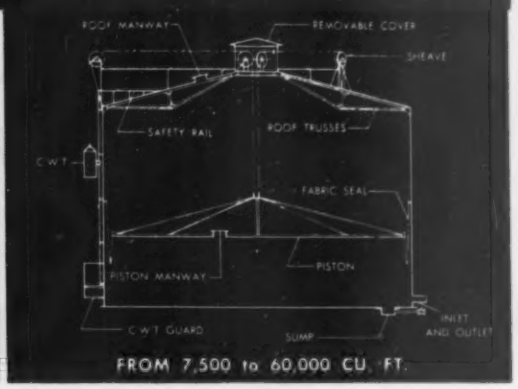


OVER 60,000 CU. FT.



FROM 7,500 to 60,000 CU. FT.

have proved a profitable investment,

because they offer . . .

1. A Gasholder with efficient operation and easy maintenance.

a. Not affected by snow load since all moving parts are under cover.
b. All major moving parts accessible for inspection during operation.
c. A vapor balancer that can be made gas free for repairs in a few hours.
d. A vapor seal that has a life equal to that of the tank.
e. A Gasholder working pressure of ⅛ to ¼ inch of water.

2. A vapor balancer that has a 100% Dry Seal.

a. Eliminates corrosion problems attendant with wet seals.
b. Requires no heating system during freezing weather.
c. Has no evaporation loss through a water or oil seal.
d. Requires no attention, adjustment or lubrication.

3. One vapor balancing mechanism for all tanks.

a. Provides flexibility of operation.
b. Permits repair of any tank in group without affecting operation.
c. Allows vapor balancer to be removed without disturbing storage tank operation.
d. Accomplishes all venting through one master valve.
e. One structure for protection of all standing and pumping loss.

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Dry Seal Lifter Roof
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For more complete details and Pay-Out Analysis, write for Bulletin VB-10

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This appliance, made in a range of sizes producing up to 2,400 gallons of foam per minute, delivers mechanical foam at the end of the water line. It operates on low water pressures and can be used as a portable fire fighting unit or embodied in a complete fixed installation for Oil Storage Tanks.

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This new appliance is particularly suitable for the fire protection of Oil Storage Tank Installations and Refineries. Also made in several sizes producing up to 2,400 gallons of foam per minute. Uses a water pressure of 150 lbs. per sq. in. and operates in the water line. It is capable of passing foam through up to 400 ft. of hose or fixed pipe line.

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Specially designed Foam Tenders are built embodying a sufficient complement of Pyrene Foam Compound and Pyrene Foam Making Branchpipes to cover bulk oil fire risks, these tenders which may be equipped with one or two independent pump units is governed by the nature and area of the oil storage installation involved. A typical tender of this type already in use produces a total foam output of 130,000 gallons without replenishment of Foam Compound.

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These Tenders are also built to suit specific requirements. Typical examples now in operation carry 500 gallons of Foam Compound, a booster pump, and 2 or 4 Mechanical Foam Generators each producing 1,250 gallons of foam per minute. They are also equipped with 6-50 lb. Cylinders of CO_2 with Hose Reels and Distributors.

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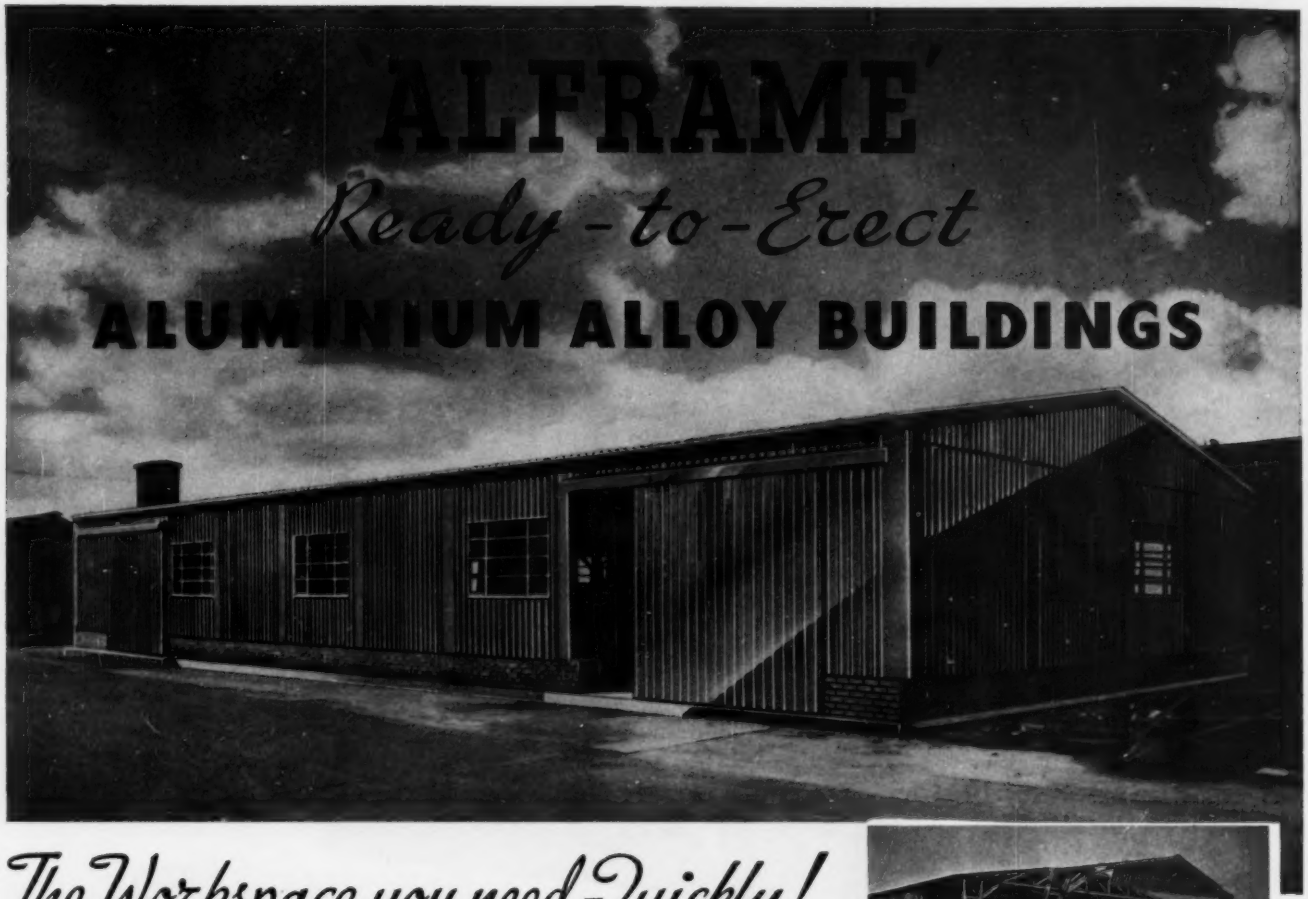

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Interior of typical Alframe building.

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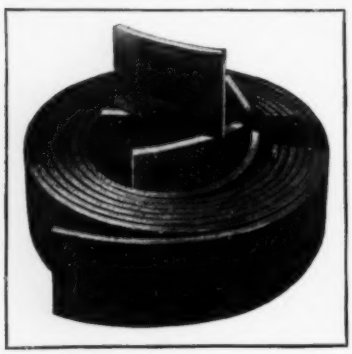

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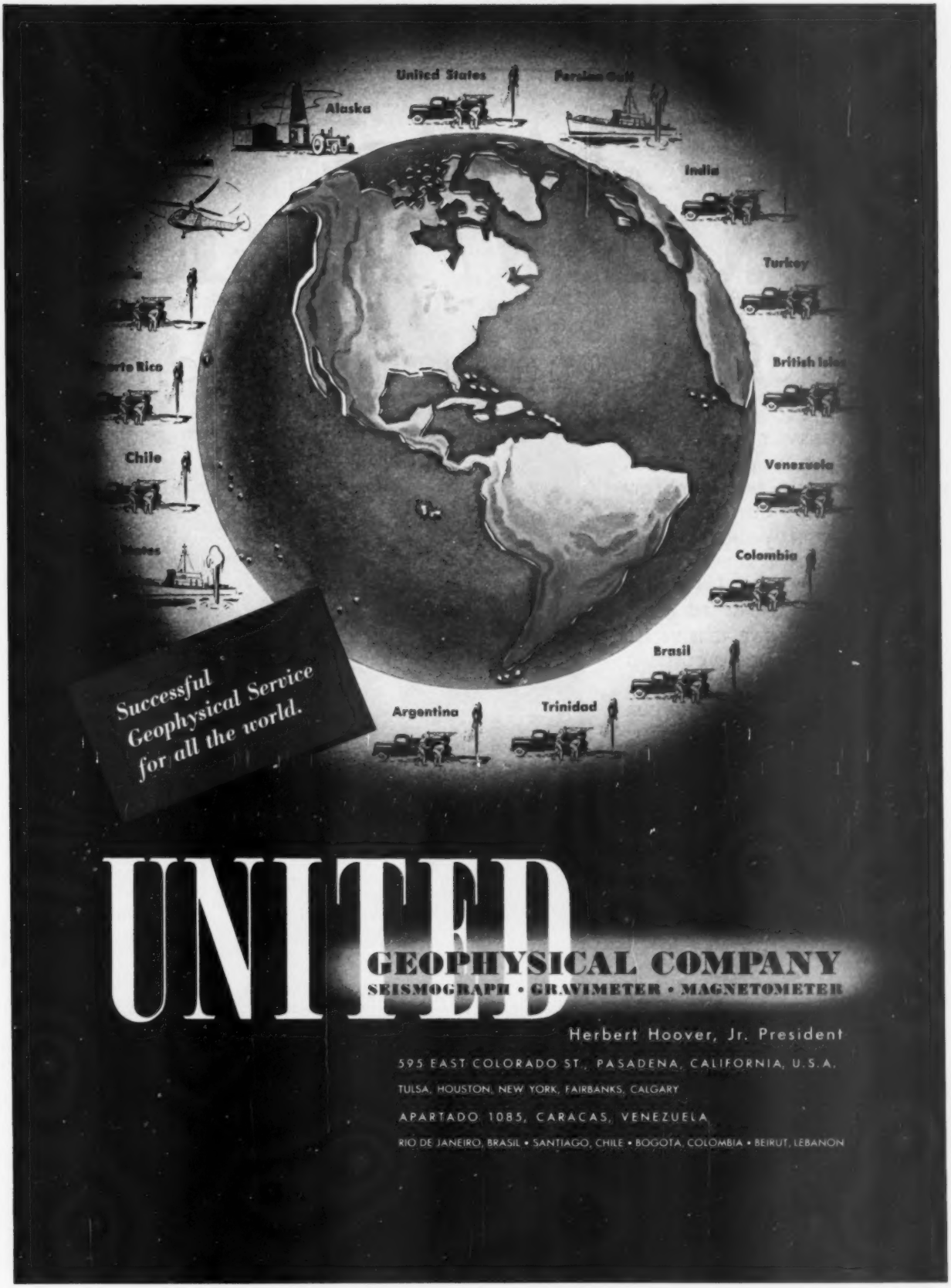

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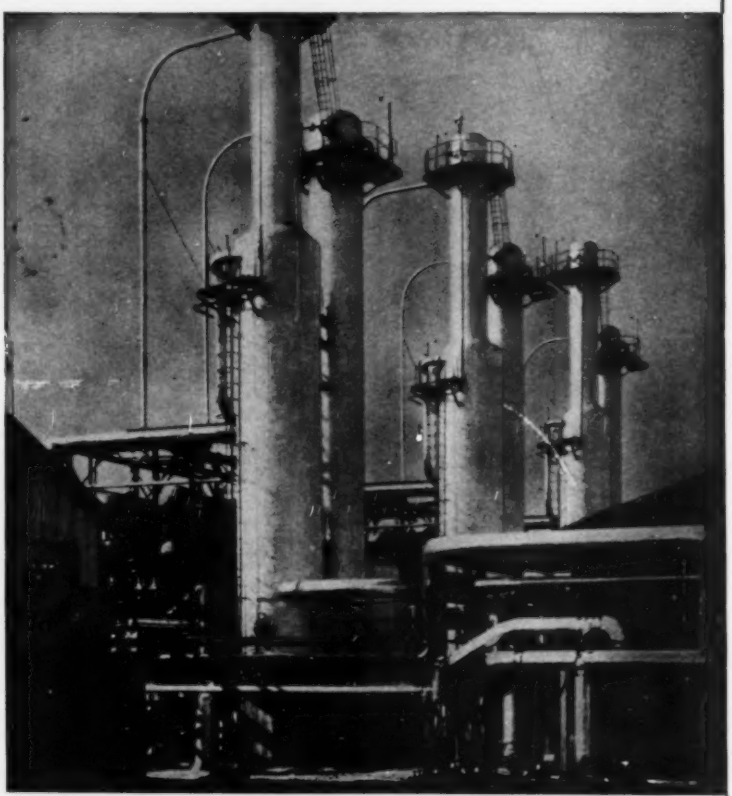

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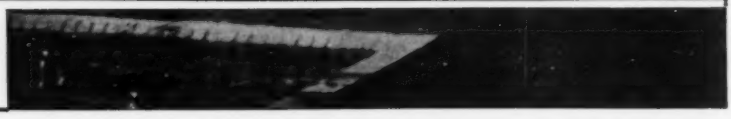

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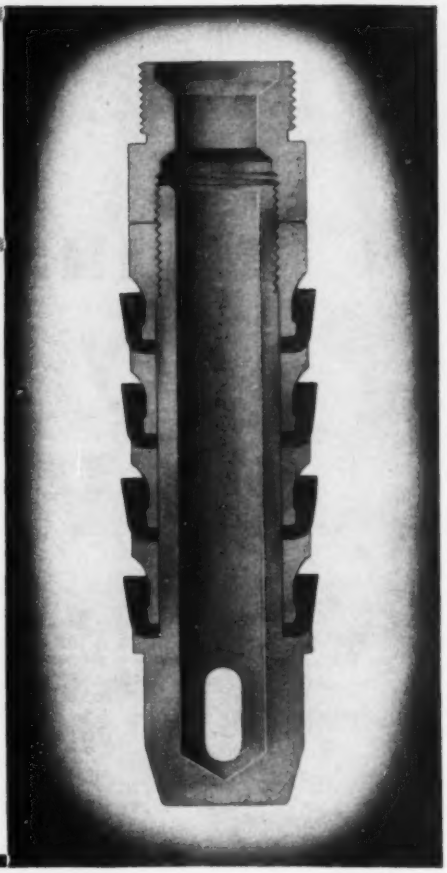

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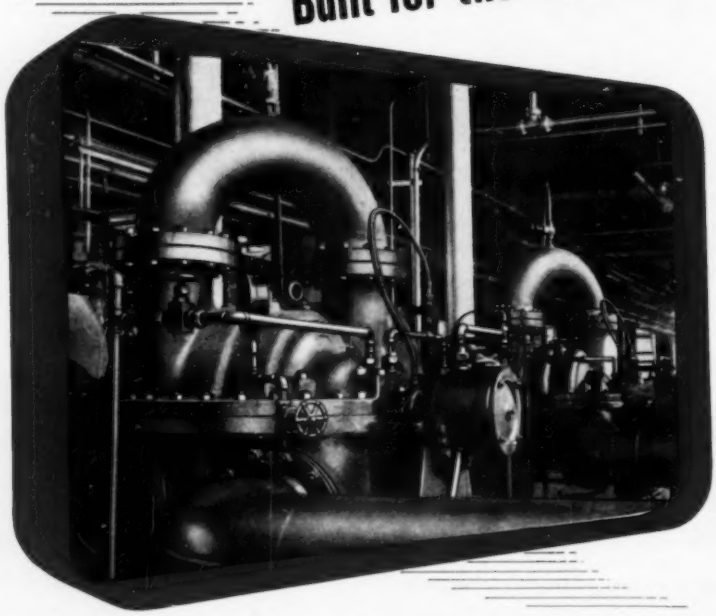

Sigmund Process Pumps are designed to deal with difficult pumping problems, where extreme temperatures, high pressures, and corrosive and/or volatile liquids are to be handled. They are built to the specifications of the leading Oil and Chemical Companies throughout the world, and a comprehensive range of pumps is available.

The photograph shows a battery of Sigmund Process Pumps installed in a new Cardon Petroleum Refinery in Venezuela.

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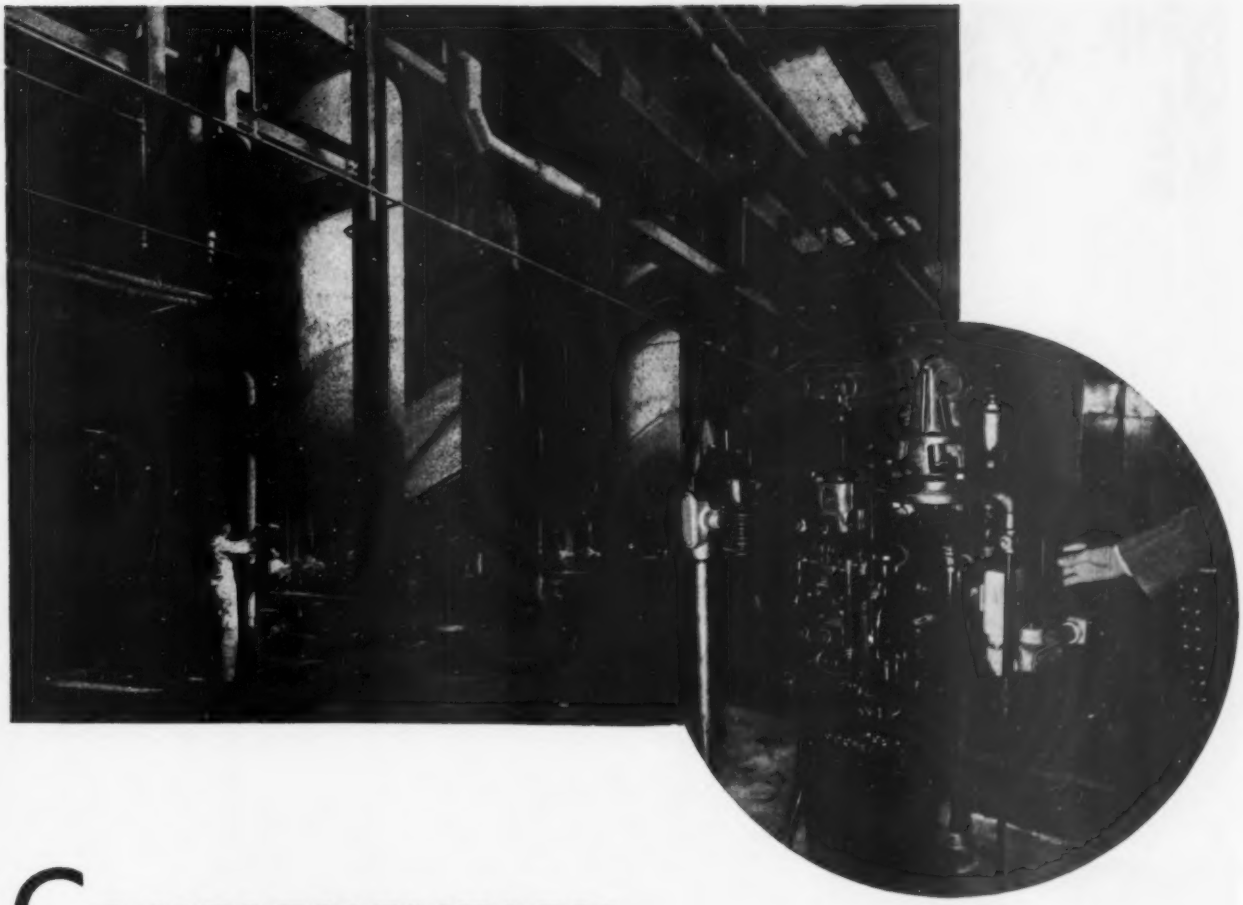

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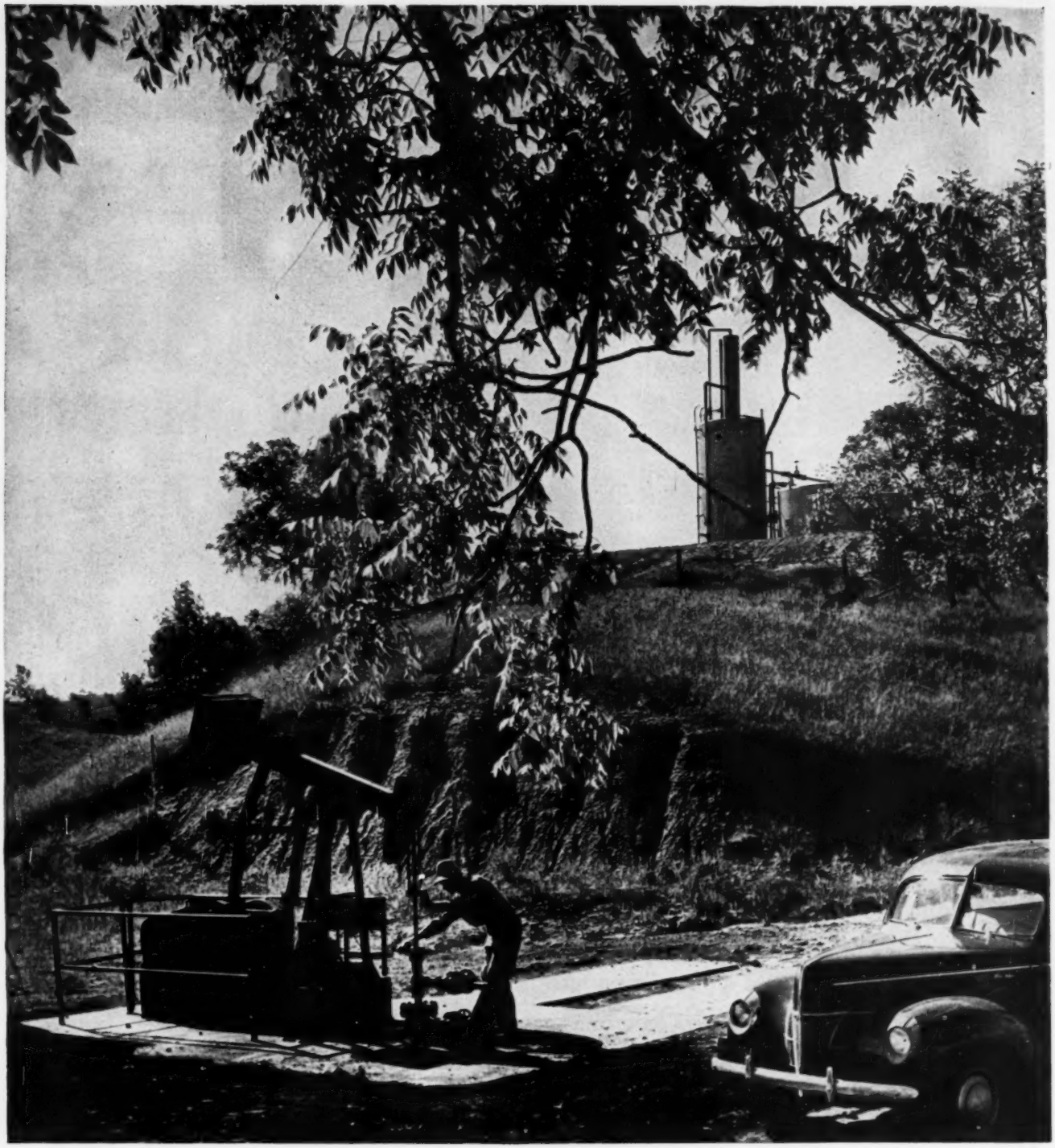

"Our security as a nation today lies partly in the fact that we have the strength which arises out of being an enterprising land...because there are rewards available to those who take risks."

From "The Public Responsibilities of Big Companies," a speech by Eugene Holman, President, Standard Oil Company (N. J.)

STANDARD OIL COMPANY
(NEW JERSEY)
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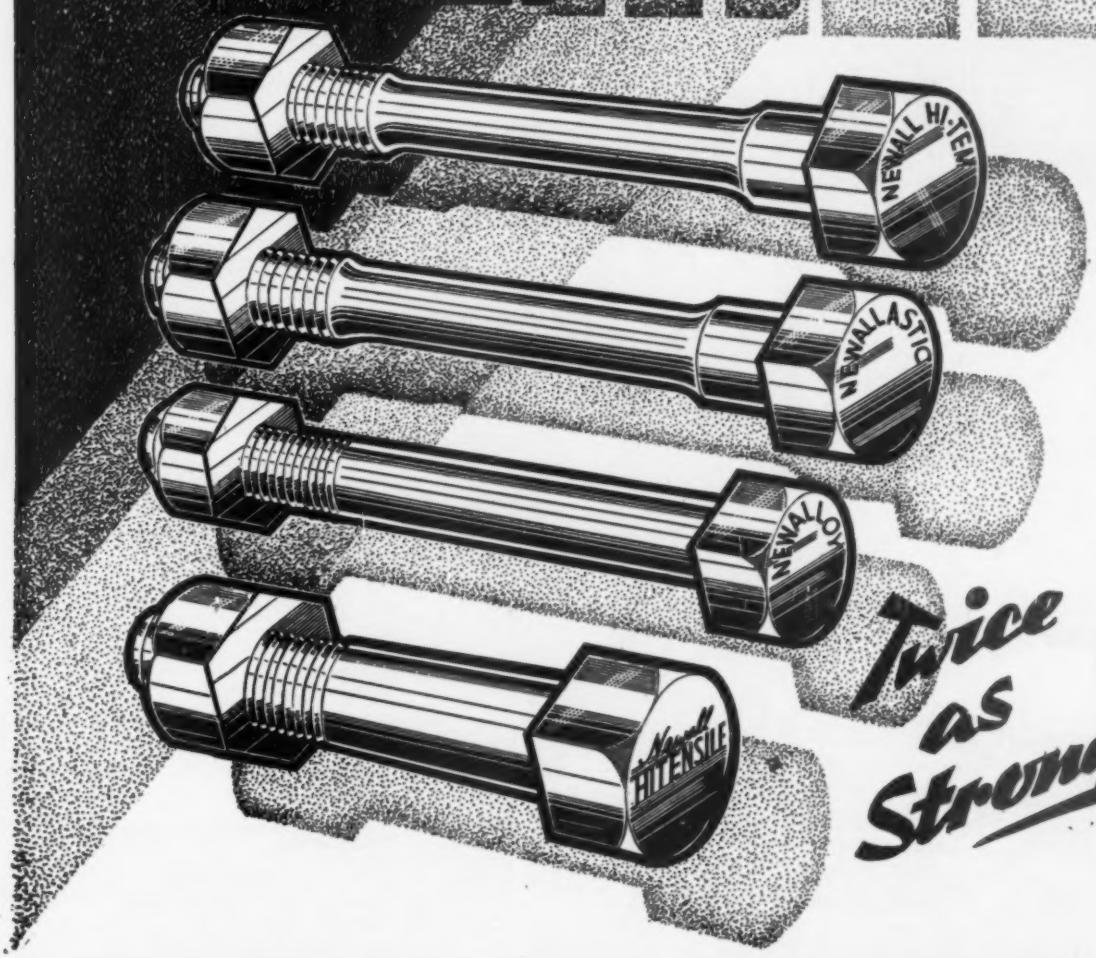

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Throughout a large part of the world Caltex is a trusted name. It is the mark of high quality for petroleum products. It provides convenient, reliable and uniform sources of supply at principal ports and terminals. And the use of Caltex products assures maximum output at minimum operating costs.

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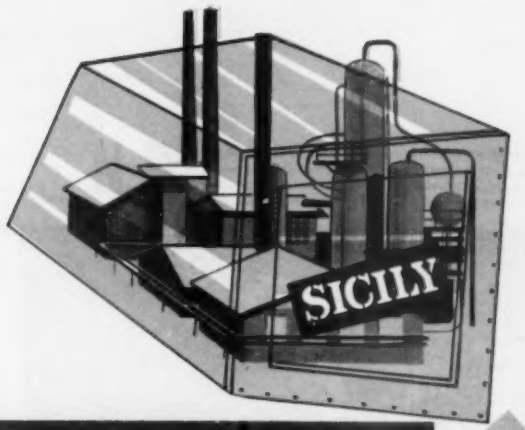
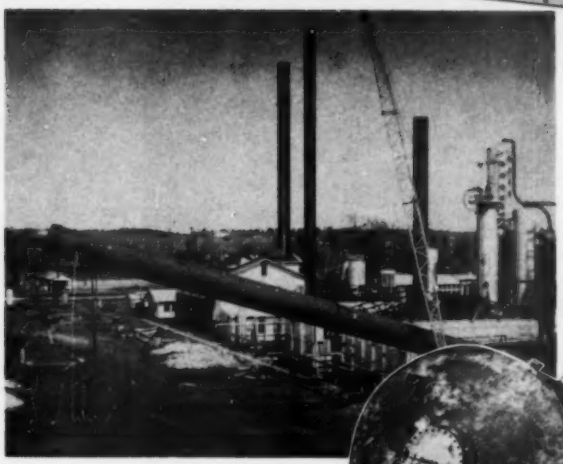
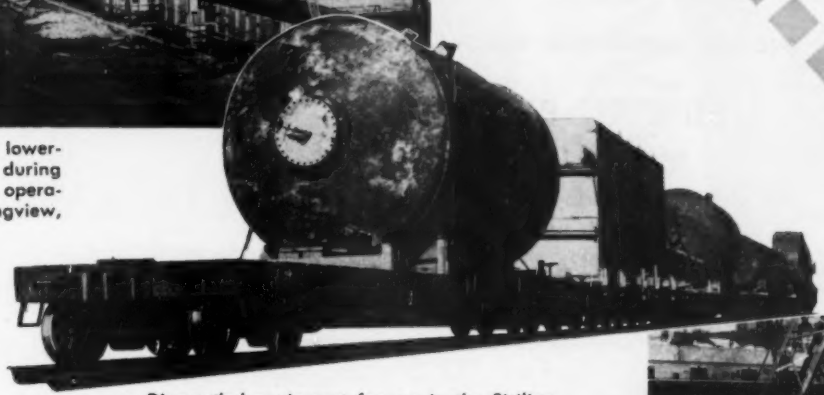


How a refinery was moved from Texas to Sicily!

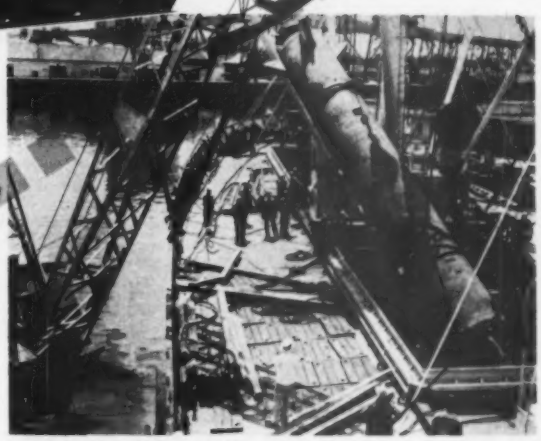
A complete 7,500 B/SD crude refinery, located near Longview, Texas, was dismantled, matchmarked, crated and loaded for shipment to Augusta, Sicily. That's the unusual job we have just successfully accomplished—in only 65 workdays—for Raffinerie Siciliane Olii Minerali, SA (RASIOM) of Milan, Italy. In addition, we are preparing mechanical design and complete drawings for re-erection of these facilities as a 10,000 B/SD refinery.



Crane shown lowering a stack during dismantling operations at Longview, Texas.



Dismantled equipment for use in the Sicilian refinery prepared and loaded for transport to docks at Houston.



Reaction chamber, weighing 73,500 pounds, being lowered into hold of vessel at Houston.

Primarily we are Engineering Contractors specializing in natural gas processing facilities, but—as in the case of the RASIOM job—our organization is flexible enough to meet out-of-the-ordinary requirements.

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DELTA ENGINEERING CORPORATION

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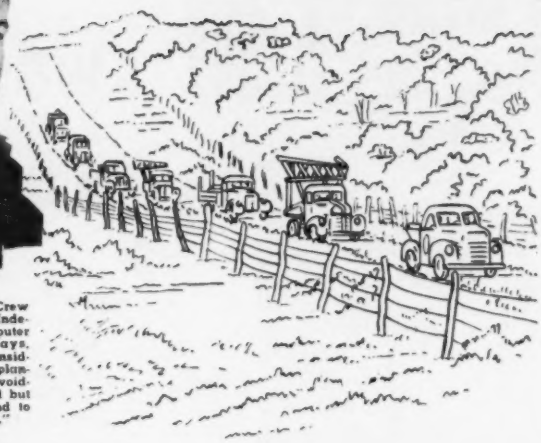

G. H. Harrington, Jr., Party Chief of Crew No. 3, is a veteran of 14 years with Independent, and has worked as a computer and observer. Mr. Harrington says, "While accuracy is the important consideration, we have found that careful planning, systematic field procedure, avoidance of lost motion, and simplified but thorough computation methods tend to increase both accuracy and speed."

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Independent's efficient, experienced crews can make your exploration program more profitable.

POINTING THE WAY IXO FOR THE DRILL

Independent
EXPLORATION COMPANY
Geophysical Surveys
ESPERSON BUILDING HOUSTON, TEXAS

N.B. While it is axiomatic that return on investment—the *ultimate earning power* of a refinery unit when actually on stream—is the only true evaluation of competitive engineering recommendations, initial plant costs remain a major factor in refiners' decisions on plant installations. M. W. Kellogg takes specific steps to *minimize initial plant costs* consistent with the achievement of *highest ultimate earning power*.

HOW WATCHING AN ANGLE CAN SAVE $20,000

Watching an angle, in this instance, concerns a main vessel and the saving is not in steel, pipe or concrete. Of all things, it is in the cost of derrick operations.

Most refiners know that Kellogg was the first to utilize gigantic, 150-ton-lift, centrally-located, guy derricks in refinery construction, a practice common in the industry today. However, probably few refiners give much thought to the fact that the ability of these derricks *to lift* varies with the distance the object to be lifted is from the base of the derrick and, therefore, with the *angle* of the boom.

But that's an important point to remember in refinery engineering—to forget it can cost appreciable amounts of money. For instance, most refinery jobs embrace a half dozen or more major lifts in connection with placing vessels. If, because of some minor oversight in the original planning, any one of them is incorrectly located—even as little as a foot outside the possible lifting radius of the guy derrick—there is an extra item to go into the cost sheet for special rigging. It may run as high as $20,000.

That's one reason why, at Kellogg, plot plans are created jointly by the Engineering and Construction groups . . . why many other phases of refinery building—structural steel, foundations, insulation, buildings to specify but a few—are designed through close collaboration between these two groups.

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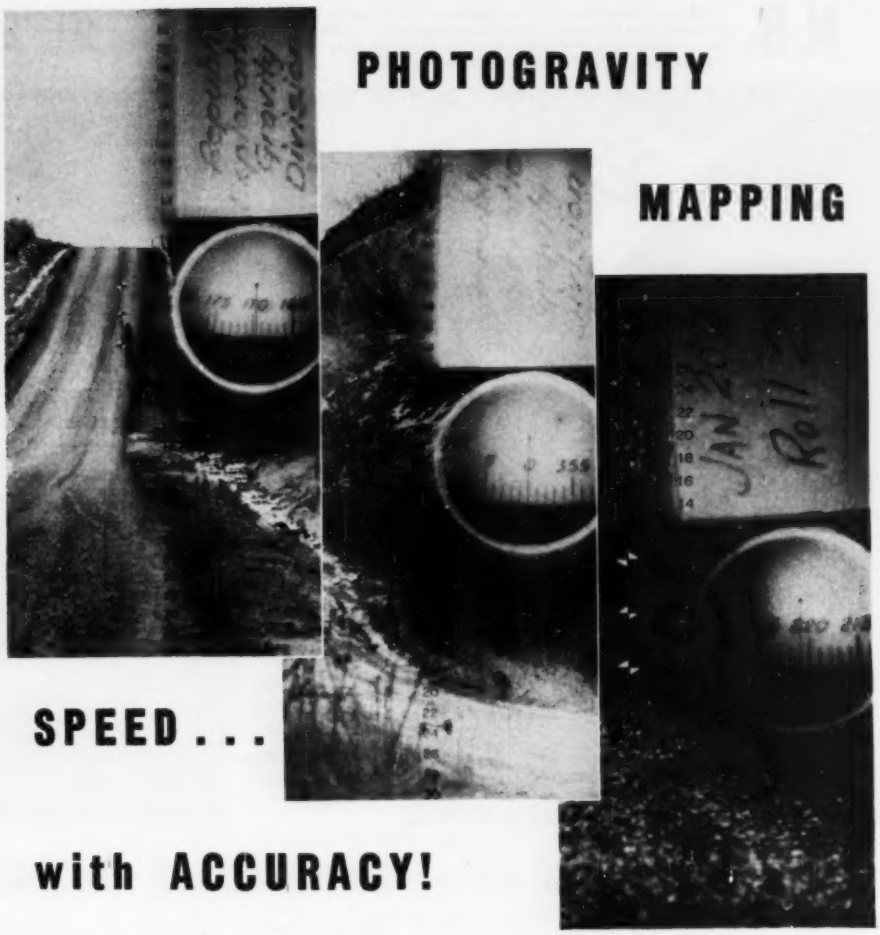

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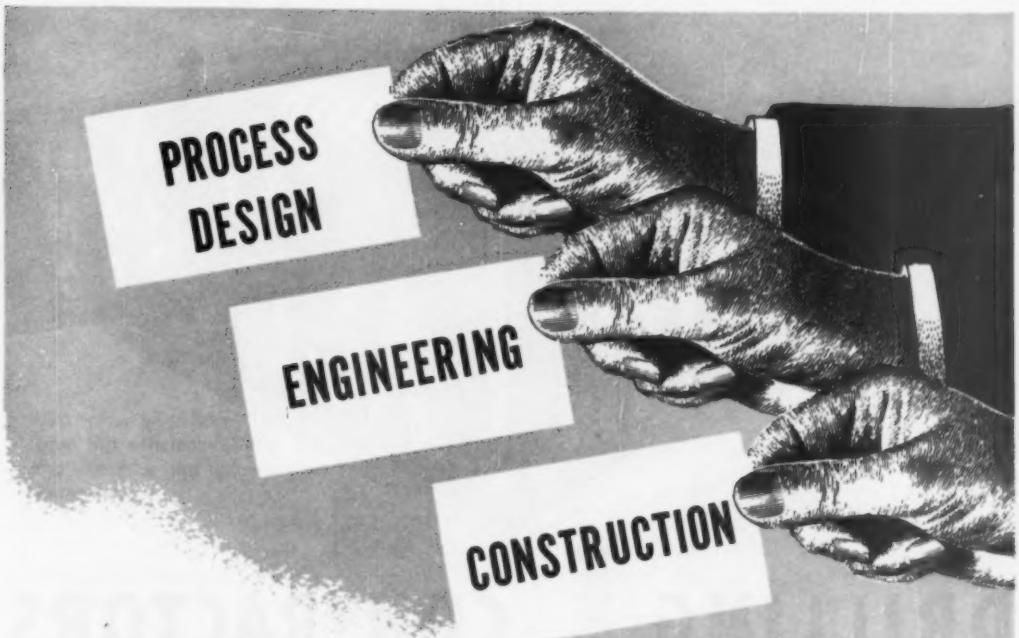

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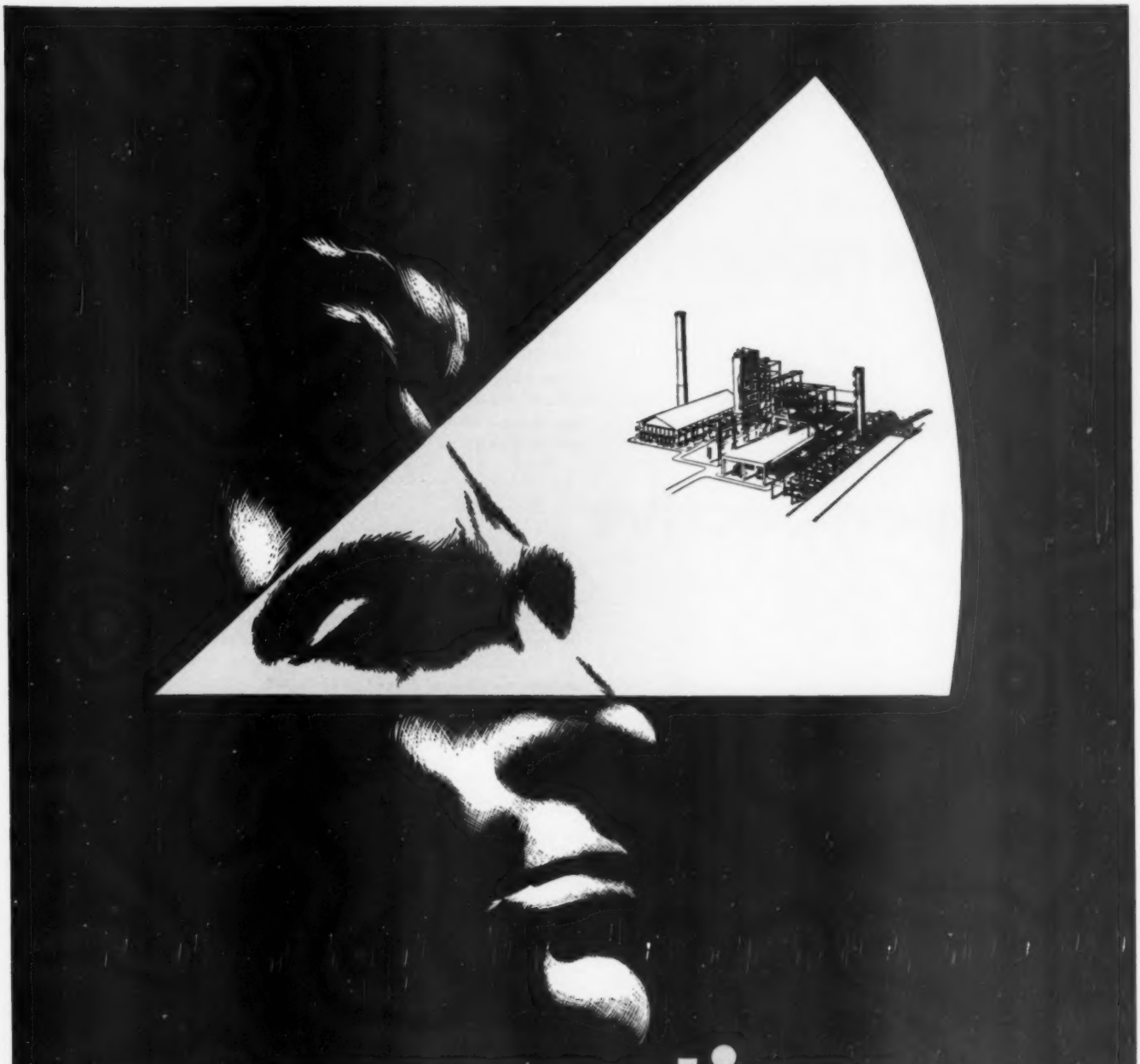

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This Month's Cover

Bringing in a well in the Leduc field in western Canada. Color plates depicting the spectacular operation of getting a well ready for commercial operation are reproduced through the courtesy of Imperial Oil Ltd. In the past 18 months since the first well was brought in at Leduc the proven reserves in the Prairie Provinces have increased from 200 million to 1,000 million barrels. Many of the producing fields still are one-well pools so that the reserves actually discovered to date may be much larger than present estimates.

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Our feeling, as we complete a quarter-century of service, is one of deep-felt appreciation. We are grateful for loyal employees, for exceptional opportunities and for the confidence and good will of the industry we serve. It is the confidence of our customers that made possible our growth, their good will that inspires our plans and guides our policies . . .

EDITORIAL

OIL INDUSTRY ADJUSTING TO CHANGED CONDITIONS

IN the oil industry the pendulum measuring relations between demand and supply seems to swing further and faster than in most other kinds of business. No sooner does the clamor raised by allegations of impending shortage and a rapidly dwindling petroleum supply die down than our ears are assailed by predictions of an approaching flood of oil that will engulf the world and upset the normal functioning of trade and production.

Such gravitational changes are encountered in practically every line of human endeavor, but in most instances the disasters conjured up by anticipatory fears are never realized by actual events. Such, we feel confident, will be the outcome in the present case. Oil is not beyond the influence of changes in the economic climate. It is too intimately involved in the scheme of daily life and activity not to be affected by acceleration or deceleration of that vast movement. But oil has one important factor in its favor. It is a dynamic industry. Its share in supplying energy for the world's work and in simplifying and making more productive man's own efforts has steadily increased and is continuing to increase. The number of its products and of its applications to new uses has constantly grown and is continuing to grow. In time to come it may be supplanted by some new form of energy, but that time is not within the vision of any man now living. In ninety years petroleum has revolutionized agriculture, transportation and living conditions, and its role in all these fields is every day becoming more important.

It was not to be expected that the heavy pressure of demand put upon the oil industry by the war and postwar developments would continue indefinitely. Accentuating the effect of the declining rate of consumption due to the recession of business activity in the United States was a factor that could not have been foreseen, the mildest winter of many years in the northern part of the country in 1948-49. To avoid a repetition of the near shortage of heating oils experienced in the preceding season, refiners had built up their stores of that product and had entered into contracts for imports which could not be immediately cut off. The rise in stocks that resulted from this combination of circumstances threatened to tax available storage and led to a reduction in domestic crude output of approximately six percent. The setback to oil operations was less serious than that experienced by some other businesses but it was sufficient, in addition to the slowing down of production, to bring about the shutdown of some few refineries.

At no time, however, did it appear that there would be an actual decrease in the consumption of petroleum products during 1949 as compared with the preceding twelvemonth but simply a decline in the extraordinary rate of growth that had been maintained over several years and to which the industry had geared itself. There are indications now that adjustment to new conditions both on the side of supply and on that of demand is getting well under way. Consumption of motor fuel has been maintained ahead of last year throughout the season. A steady rise in diesel fuel use likewise has taken place. Rising demand for heating oils and residuals, which have been soft spots in the market, and indications that available stocks will be needed to meet requirements have led to a strengthening of prices. As a result of this condition a moderate rise in production is anticipated for the immediate future.

One of the causes of apprehension has been the growing output of the Middle East and the fact that oil from the Persian Gulf has been shipped to both North and South America. The vast reserves of the region and the great productivity of its wells have been used in painting a picture of future invasion of the markets of both hemispheres to the injury of existing industries now serving those areas. In this connection criticism is leveled at American support of the current program of European recovery on the ground that it is aiding in the upbuilding of a great refining industry in western Europe that will give Mid-East oil complete dominance of that market.

As a matter of fact the success of the European recovery program will go a long way toward solving any problem of oversupply of oil that may presently exist. If success is achieved, it will be built very largely upon a greatly increased consumption of petroleum products that will bring about within the next few years a daily demand for a million and a half barrels more than the prewar consumption. The gain that already has taken place indicates at least a fair possibility that this increase will be realized.

At the same time the use of petroleum will continue to grow in all other parts of the world, and its growth will be accelerated by the progress of industrialization for which a strong impetus now exists.

Existence of a substantial reserve of potential production which can be drawn upon in emergency is not a detriment to the industry but an element of strength, contributing to the independence of the industry and its freedom from undue governmental interference.

TRANS-ARABIAN PIPE LINE OPENS NEW CHAPTER IN INTERNATIONAL OIL HISTORY

WITH the disposal early in July of the last of many questions that have interposed themselves in the course of the past three years, the green light was finally given for completion of Trans-Arabian Pipe Line—Tapline, as it is known among oil men. It is safe to say that no other previous oil transportation project has aroused more controversy or has held possibilities of exerting equal influence on the international situation.

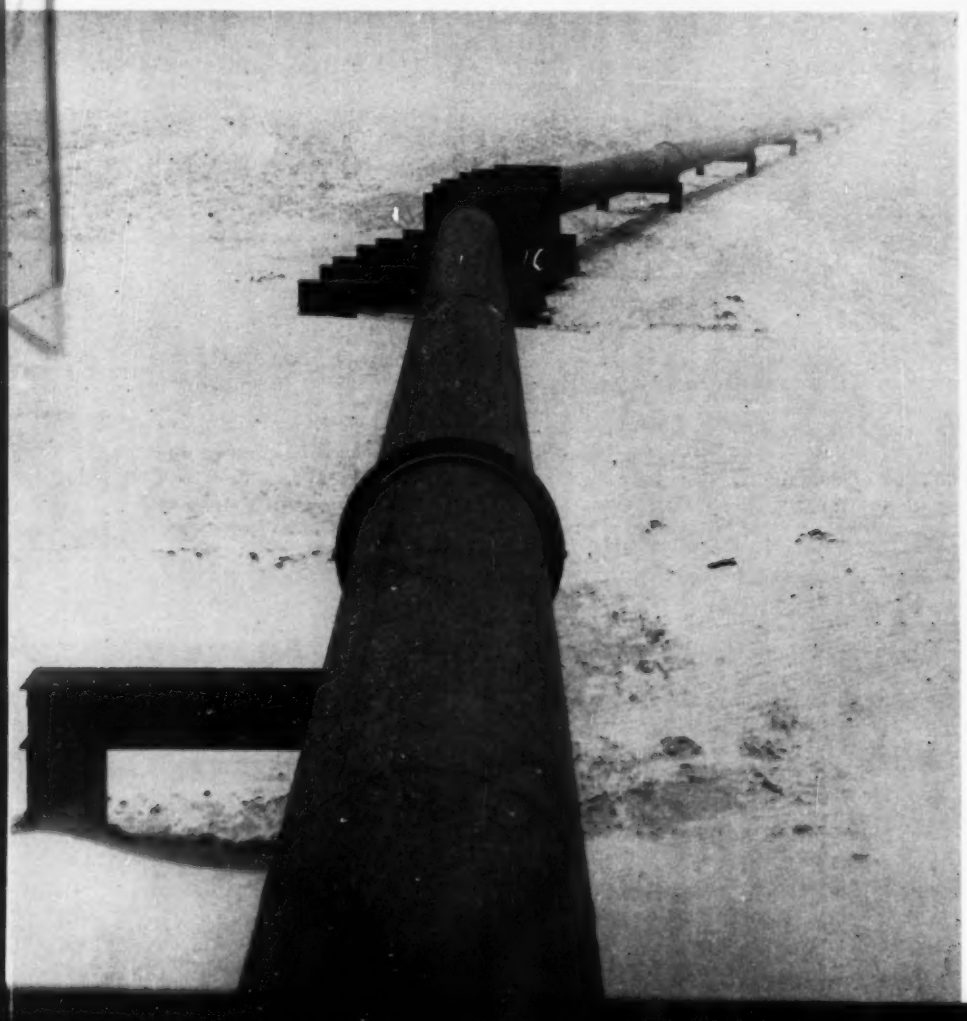
Discussion of an overland transportation system from the Persian Gulf to the eastern Mediterranean began early in World War II, when it was proposed that the United States Government should construct such a line because of its military value, the theory being that the project was too costly to be undertaken by private capital. Public opinion expressed itself as strongly opposed to the government engaging in the oil business, especially in that distant part of the world, either as owner or operator, and the proposal was dropped. In 1945, however, The Texas Company and Standard Oil of California, then joint owners of Arabian American Oil Company which operates the oil concession in Saudi Arabia, decided to put through the much-discussed enterprise on their own account and organized the Trans-Arabian Pipe Line Company. Later on, when Standard Oil Co. (N. J.) and Socony-Vacuum Oil Company acquired shares in Arabian American, the same proportional ownership was extended to the pipeline company. Burt E. Hull, veteran pipe liner who had directed the construction of the Big Inch lines extending from Texas to the Atlantic seaboard, a war emergency undertaking, was put in charge of the enterprise and became president of Trans-Arabian.

Political turmoil in Asia Minor created uncertainty as to the location of the western terminal of the line, a question that was not finally decided until the present year. It was necessary, therefore, to consider and make preliminary surverys of alternate routes. These were made in 1947 by engineering parties, one covering the eastern portion of the line from Abqaiq for a hundred miles or so toward the interior. A central party working eastward from Trans-Jordan ran location for the remaining portion of the route within Saudi Arabia. A third group made reconnaissance survey from Lebanon across Syria, although at the time it was far from certain that any part of the route it studied would be finally adopted.

Likewise the construction of the western section of the line had to be delayed and in fact is only now getting under way. No such obstacle applied to the eastern segment which follows a route entirely within the borders of Saudi Arabia, and it was here that initial work was begun in the latter part of 1947.

Before actual construction could be started, a vast amount of planning and preparation was required. Many unusual conditions had to be dealt with. The monumental task was to be performed 10,000 miles or more from the source of supplies, which in the main had to be brought from the United States. The size of pipe selected, larger than any previously used for the movement of oil, posed a special problem of shipment. The pipe line was to run through a region roadless, habitationless and well-nigh waterless. In some places its course was marked by shifting sands; in others hard rock ledges close to the surface made ditching slow and expensive. Delivery of equipment at a convenient point involved construction of a port and unloading facilities on the Persian Gulf. A working staff of specialists and experienced pipeliners had to be assembled and prepared for the difficult construction job. Not least of the problems was that of housing and provisioning a small army of men while the work was going on.

Answers to the questions thus raised and to many others were supplied by engineers of the company



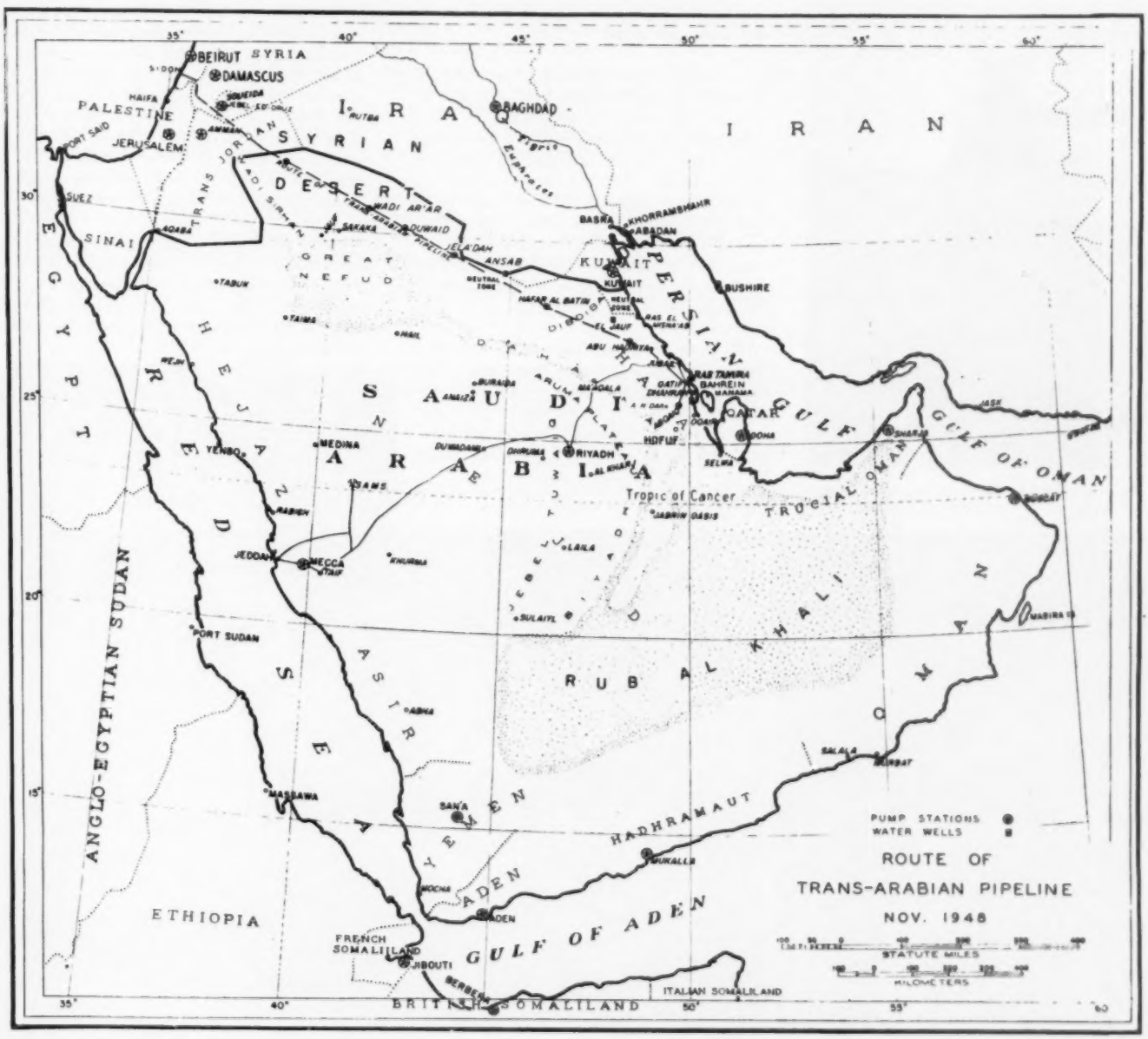
Thirteen-degree angle in the Trans-Arabian line showing provision made for movement of the pipe. Six bearings are provided at the point where the line bends. Photographs and map with this article courtesy Arabian American Oil Co.

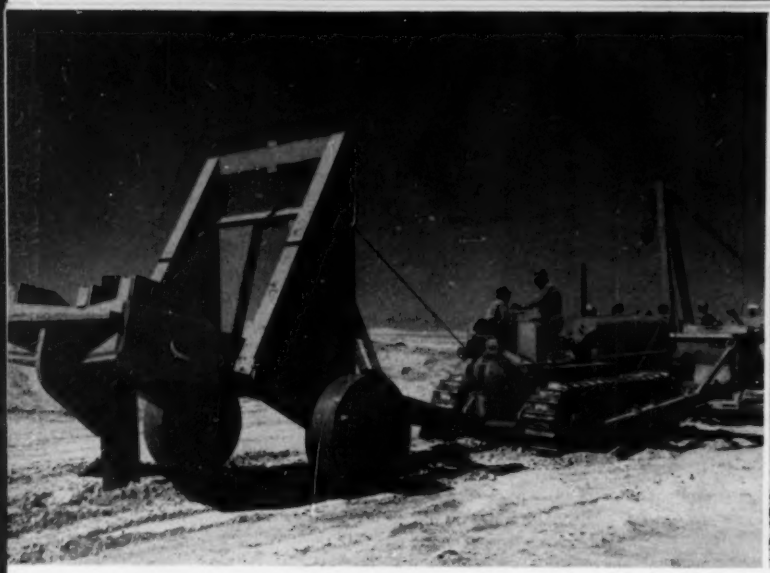
aided by representatives of the firms supplying equipment, and, where practicable, field tests were applied to check conclusions. Trucks and trailers designed to convey pipe and other heavy equipment across the difficult terrain were sent to the rough and sandy sections of Arizona where they hauled loads under conditions similar to those of the Arabian desert. Shipping space was economized by having the pipe made in two sizes, with diameters of 30 and 31 inches, so that the smaller sections could be nested inside the larger. After careful study it was decided that only portions of the line need be buried and that the remainder could safely be run above the surface.

Because of the shorter land haul it provided for moving supplies to the line, it was decided to establish a receiving terminal at Ras el Misha'ab on the Persian Gulf, 170 miles from Abqaiq, starting point of the line, and close to the neutral zone between Saudi Arabia and Kuwait. Here the first ship loaded with equipment dropped anchor in August 1947. Ocean vessels could not approach nearer the shore than about two and a half miles, and first cargoes had to be landed by barges at an improvised dock. This was succeeded by a more substantial stone pier and later by a device borrowed from the logging industry and adapted especially to the handling of line pipe. This is an aerial tramway known as the Skyhook. The cableway is three miles long extending from deep anchorage to a short distance inland. It is supported by heavy timbers mounted on piling. The carriages, suspended from the cable, are equipped with gasoline engines and the three carriers in use are able to discharge a thousand tons of pipe in the course of a day.

In a desert operation such as the building of the pipe line, one of the first essentials is the provision of a water supply. One of the earliest activities of the company, following surveys, was the drilling of a number of wells. For this purpose a cable tool rig was employed. The wells vary in depth from 250 to approximately 1,000 feet. With the selection of sites for the pump stations the pattern for the water system has been set. Each station will have a well with storage for 250,000 gallons, and on each section between stations there will be two wells with tank storage for 10,000 gallons. Wells are cased with six or eight-inch pipe and are operated by pumps driven by gasoline engines. Troughs placed outside hold water for use of natives and their flocks, and extension pipes enable the drivers of cars and trucks to fill their radiators as needed.

One of the difficult problems encountered at the Ras el Misha'ab camp was that of water supply. The only water obtainable locally was brackish and unfit for consumption, and the nearest source of a potable supply is El Jauf, some 40 miles distant. The solution adopted by the company is





Two bulldozers hooked to the 18-ton giant ripper designed to open a trench for the line in some areas.

Ditching machine at work several miles south of Qatif. Pipe must be laid almost immediately after the ditch is opened because the walls slough away.

Five foot trench dug by the ditcher with following drag. About four-fifths of the line will be buried.

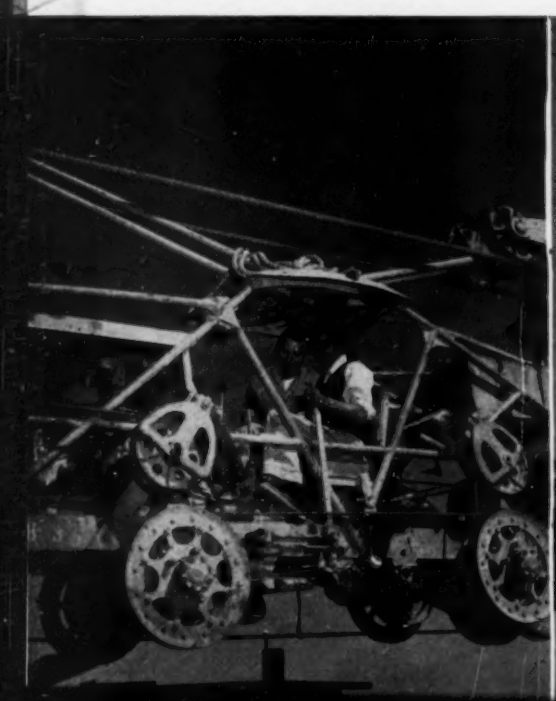
the installation of elaborate equipment for the distillation of sea water.

First consignment of pipe reached Ras el Misha'ab late in December 1947 after a voyage from California which occupied approximately 40 days. About the same time the company made a change in the route of the line as originally planned. Instead of heading directly from Abqaiq toward a Mediterranean terminal, the first section of the line was directed to reach other fields at Qatif and Abu Hadriya with a connection to Ras Tanura, making it possible to deliver oil from these fields to the refinery there, pending completion of the remaining portion of the line.

With all the preliminaries completed, the greatest movement ever undertaken for a single engineering project was prepared to go forward with military precision. Construction of the eastern portion of the line, about 650 miles in length, and of the landing station on the Persian Gulf was entrusted to Bechtel International, Inc., composed of a group of contracting firms experienced in large-scale operations, while the western section of something over 400 miles and the Mediterranean terminal was placed in the hands of Williams Bros. Corporation, builders of many of the world's most important pipe lines on three continents. Equipment pertaining directly to construction of the line was purchased by the general contractors, subject to approval by the company.

Plate for the huge line, some 270,000 tons altogether, was manufactured at the Geneva, Utah, plant of United States Steel Corporation in lengths of 31½ feet and ½ to ⅜-inch in thickness. It was rolled by Consolidated Western Steel Corporation at its Maywood plant in Los Angeles, California. The plate was cold rolled and electrically welded along the longitudinal seam. It was hydrostatically tested to 90 percent of the circumferential yield strength of 52,000 psi, though in operation the maximum pressure

Left, Saudi Arab skyhook operator and American foreman in car which brings sections of the line pipe from an unloading dock built three miles out in the Persian Gulf. Photograph at right shows how the pipe is carried.



will be no more than 65 percent of yield. As previously mentioned, the pipe was fabricated in about equal quantities of 31 and 30-inch diameter to permit nesting to save shipping space.

To move the pipe on the next long stage of its journey, a schedule of regular sailings was set up, providing for weekly departures. The fleet assembled by the Isthmian line for this purpose consisted of 15 Liberty-type vessels so extensively used during the latter part of the war, with an average cargo capacity of about 10,000 tons. While something over 80 percent of the total tonnage to be moved consisted of pipe, early sailings had to include larger quantities of construction equipment, such as bulldozers, tractors, trucktractors, trailers, ditchers, graders, wrapping and back filling equipment, as well as camp equipment and refrigerator cars for supplying food and water to working crews.

As an indication of the extent of land transport requirements of Tapline construction, it may be noted that the automotive equipment engaged in this branch of the service includes over 1,500 units. Among these are 150 trucktractors of 50 tons each, 120 ten-ton trucks, 500 trailers, 80 refrigerator trucks and trailers for transporting perishable foods, 60 fuel and water trucks, 12 lunch-serving trailers, four buses of 60-passenger capacity, 10 sixty-passenger trailers and some 400 other vehicles, including passenger cars, station wagons, jeeps and a variety of other types. This is exclusive of earthhandling machines, bulldozers, Caterpillars, ditchers, graders and others which are power equipped but not used primarily for transportation.

On arrival at the sea island which has been constructed offshore from the camp at Ras el Misha'ab, pipe is discharged by means of the Skyhook, each traveling carriage being able to handle a load of 10 tons from the ship's hold to the stockpile on shore with no manual labor involved except for the operators of the traveling carriages and a small ground crew to attach and detach the cables at the beginning and end of each run.

Following delivery on shore the pipe is denested by a special machine, and three lengths are then welded into a string before being moved to the pipe line route. There is a double reason for this: first, the combination of truck and trailer can handle lengths of 93 feet; and, secondly, welding can be done with less time and effort at a fixed station than along the route, where equipment must be moved after each jointure.

Welding is done by the automatic shield arc method, using a machine developed by the Westinghouse Company and equipped with a mechanical line-up clamp which rotates with the pipe over a water-cooled back-up shoe while the weld is being made. Each of these automatic welders can average four complete welds per hour.

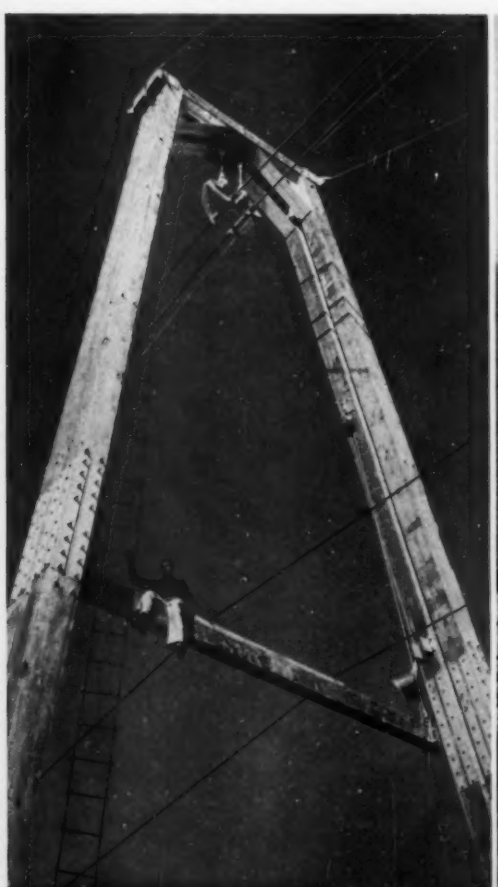
To convey heavy loads over the rough terrain of Saudi Arabia and its even more difficult sandy areas requires vehicles especially designed and equipped for desert conditions with plenty of power, large capacity cooling systems and big, low-pressure tires. To meet these requirements a fleet of 30 specially-designed Kenworth trucks, driven by Hall-Scott 300-hp engines, were selected. Pipe handling trucks are equipped with fifth wheels and dual axle dollies. Each truck carries a double radiator with twice the capacity of the largest used elsewhere and also carries 300 gallons of gasoline for its own use. It can handle gross load up to 50 tons; the average load, consisting of nine to ten 93-foot lengths of pipe, ranges from 35 to 40 tons.

Complementing the pipe-carrying trucks are Fruehauf dual axle pole dollies capable of sustaining loads of twenty tons and equipped with 16-inch metal saucers to prevent the legs from sinking into the sand if detached while carrying a load. These trailers for pipe transportation are part of an order for 300 units placed with the Fruehauf Company for various uses in connection with the maintenance and operation of the line.

Tires are a highly important factor in desert operations. Pipe-carrying trucks and trailers are equipped with eight, ten or twelve-ply tires 14 x 20. In sandy areas tires are inflated only to 15 to 20 pounds for most effective traction.

Owing to rock formations close to the surface which make ditching slow and costly, about one-fifth of the line is being built above ground, resting on concrete bases where the subsurface is solid and being suspended from steel bents where subkas or marshy spots are to be crossed. The

One of the "A" frames of the skyhook operation at the Ras el Misha'ab base camp. There are 21 of these frames in the three-mile space between unloading platform and shore.



Looking toward the Saudi Arabian mainland from the Trans-Arabian Pipe Line Company's unloading dock built three miles out in the Persian Gulf where water is deep enough for ocean vessels to dock. Pipe is carried from dock to shore in five minutes by the skyhook.

Completing a weld on the 30-inch line.

"Big Buzz" loaded with pipe for a desert haul.

system followed is described as restrained above-ground construction. Changes in the direction of the line above one degree must be firmly anchored, the form of support depending upon the change in direction.

On the buried portion of the line the pipe is coated wtih petrolastic asphalt followed by a wrap of fiberglass and a final coat of asphalt. The shield thus provided is supplemented by cathodic protection, using magnesium anodes. As pipe is delivered along the route, it is swung from the trucks by a pair of Caterpillar tractors and placed above the ditch ready for welding, wrapping and lowering into position.

Six pump stations along the line will be located at points about 180 miles apart. Each of the five intermediate stations will be equipped with a series of four pumping units. At the primary pumping station located at the eastern end of the line and constructed by Fluor Corporation, two 14 x 16 two-stage Byron Jackson pumps are installed. One of these will handle the entire capacity of the line; the other is provided as a spare. These pumps, operated at 3,600 rpm by 6,000-hp turbines, are designed to operate at 315,000 barrels per day working capacity against a pressure of 800 psi. Pump casings are cast of steel tested to 1,300 psi. Impellers and shaft sleeves are of stainless steel. Both stages are double suction with double volutes. Electric current for lighting and operating motor-driven auxiliaries and other service will be supplied by three 800-KW diesel-engine-driven generators.

In the company's scheme of operation the various pump stations will not merely house the mechanical equipment for propulsion of the oil stream but each will be the center of a small community of about 20 American families and some 200 or more Arab family groups. This is in recognition of the necessity of supplying food and the amenities that make life supportable in such isolated locations.

At the western end of the line storage tanks some 16 in number, with a total capacity of 2,880,000 barrels, will be located on high ground about 280 to 360 feet above sea level and will be connected with a loading berth in 50 feet of water about a half-mile offshore by a submarine pipe line permitting loading to be done by gravity flow. A concrete pier will extend from the shore line to the loading station.

Now that construction of the line can proceed simultaneously from both the eastern and western ends, completion of the work is expected to go forward rapidly. Skilled pipe line construction men have been arriving in Lebanon during the past month, and the first shipload of equipment, building materials, pipe and supplies reached Beirut in mid-August. Final consignments of pipe will be delivered in May or June. Some six months later the crews working from both directions will meet somewhere near the western border of Saudi Arabia, and the first link between the Persian Gulf and the Mediterranean will be completed.

Headquarters for the western division will be at Beirut, Lebanon. A. N. Horne, who was associated with Mr. Hull in the building of the Big Inch lines and who recently was elected a vice president of Tapline, will be stationed there as resident manager. J. L. Culbertson is being transferred from San Francisco to Beirut as assistant manager and chief engineer. H. B. Beckley, general superintendent of the western division, will make his headquarters at Sidon.

Graver Construction Company has the contract for constructing pump station No. 6 and all oil tanks along the western section. Chicago Bridge & Iron Company will erect the steel tanks in Saudi Arabia.

As shown by the accompanying map, Tapline begins at the Abqaiq field in Saudi Arabia, and after traveling a short distance northeast and then northwest to touch the fields of Qatif and Abu Hadriya and providing a connection with the Arabian-American Company's refinery at Ras Tanura, follows a relatively straight course to the northwest near the northern Arabian boundary, crosses Trans-Jordan to Syria and then turns more sharply northwestward across Lebanon to its western terminus near the ancient Biblical city of Sidon. This gives it a total length of 1,067 miles and takes it across two low mountain ranges near its western end. For more than 900 miles of its length, however, it traverses fairly level

← Tieing in the line at the Qatif-end anchor.

Stringing pipe along the right of way. The trucks used in desert hauling are equipped with special tires and are capable of carrying loads weighing as much as 100 tons. Some of the trucks have as many as 42 wheels.

may relieve the company of some problems, it raises others, particularly that of providing for the health and comfort of its employees.

Careful study was given to these human relationships in advance. At the present time the company has some 2,000 skilled Americans and about 8,000 unskilled natives in its employ. Some of these are stationed at terminals or other points where more or less permanent living conditions are established, but throughout the period of construction many work crews are far removed from access to any means of local subsistence. For use of the construction crews which are almost continuously on the move, portable camps have been organized including kitchens, mess trailers, sleeper trailers; laundries and even emergency hospitals have been provided, all mounted on wheels and all moving along from day to day in progress with the work.

To supply these field forces with food, a large fleet of refrigerator trucks has been assembled so that daily deliveries can be made of meats and other perishables in perfect condition, while tank trucks maintain the supply of water and fuels. While all supplies used in the work, with few exceptions, are sent from the United States, the foodstuffs being shipped under refrigeration, some fruits and specialties are purchased in Levantine or Middle Eastern markets.

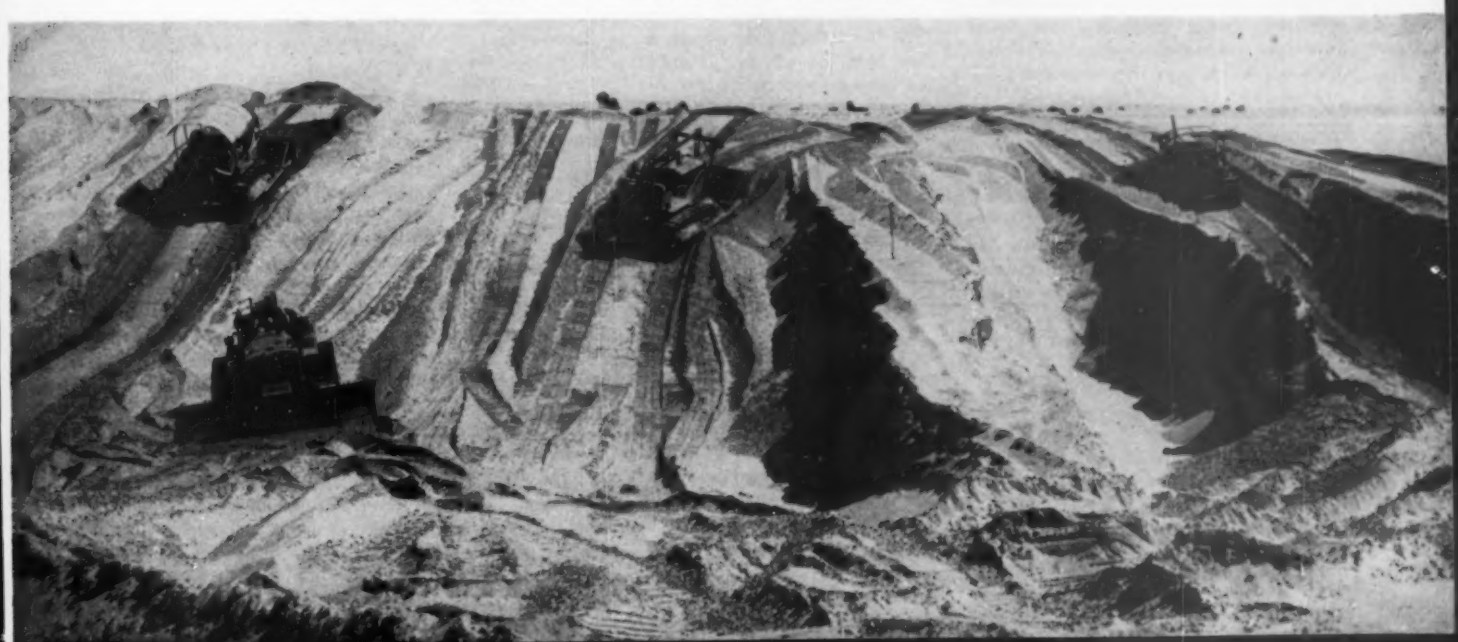
For permanent employees stationed at terminals or at outpost pump stations, comfortable homes and community services will be provided, and in addition the company will find it necessary to maintain a food service and to supply personal needs, recreational and health facilities, movies, schools, churches and mosques. To this end air fields will be laid out at each station and terminal, and regular plane service will be established. Short-wave radio has been the means of communication during construction, and when the line is completed, a regular service will be established both for operation of the line and for the convenience of employees stationed along its course who will be able to receive news broadcasts and other forms of wireless entertainment to keep them in touch with the outside world. It is interesting to note that when the complete line is ready for operation, no less than 4,922,000 barrels of oil will be required merely to fill it, so that the entire pumping capacity with roundly 36,000 hp will have to work at full capacity for nearly two weeks in order to fit the system for regular operation. In addition to the contents of the pipe itself, it is estimated that some 2,000,000 barrels will be required for working stocks at pump stations and terminals. In other words seven million barrels must be maintained in the system at all times merely in order to keep it in working condition.

Throughout the work of preparation and construction the plans and arrangements made by the management and its contractors have worked smoothly and effectively. The only serious delay was caused bby the Office of International Trade in the United States Department of Commerce

(Please turn to page 82)

Principal officers of Trans-Arabian Pipe Line Co. Left to right—C. A. Swigart, vice president; Burt E. Hull, president; and A. N. Horne, vice president. Mr. Swigart recently was elected vice president after 38 years of refinery and pipe line management with Standard Oil Co. of California. Mr. Horne is now in Beirut, Lebanon, as resident executive officer and general manager of Tapline's construction project. During the war he supervised construction of the Big Inch and Little Big Inch lines as vice president and general manager of War Emergency Pipe Lines, Inc. He recently completed supervision of construction of the Basin pipe line system and connections from New Mexico to Illinois before resigning as vice president of Texas-Empire Pipe Line Co. to join Tapline.

Moving a sand dune from the pipe line right of way 30 miles south of Ras Tanura.



ENGINEERING FEATURES OF TRANS-ARABIAN PIPE LINE*

IN early discussions of a proposed pipe line across Arabia, it was tacitly assumed that the pipe would be of 24-inch diameter such as had been employed on the Big Inch lines from Texas to the Atlantic seaboard and was the largest in use for oil transmission up to that time. When the subject came up for reexamination in 1945, however, it became clear that the 24-inch pipe was somewhat too small for greatest economy, and that for a nominal average rate of 300,000 barrels per day a thin-wall pipe of approximately 30-inch diameter would be preferable, and this size finally was adopted.

The pipe has been, and still is being, manufactured at Maywood, California, from plate rolled at Geneva, Utah. Half the pipe is 30 inches in diameter and half 31 inches in diameter, and most of it has a nominal wall thickness of ¼ inch. The steel is of medium carbon, medium high-manganese material and is semi-killed. Specification limits are as follows:

	Per cent
C	0.30 max.
Mn	.85 to 1.25
P	.045 max.
S	.0 max.

In general most of the pipe actually runs about .25 to .26 carbon and about 1.0 manganese.

When the plate arrives at Maywood, it is planed to exact size, rolled and welded inside and out by the "Union-melt" process. As fabricated, the pipe is about ½ inch undersize in diameter. After fabrication it is put into a heavy steel die and expanded under hydraulic pressure into its full size. This expansion stretches the steel beyond the yield point, and the cold work makes a significant increase in the tensile strength, especially in the circumferential direction. The specifications call for the pipe after expansion to have a minimum circumferential yield strength of 52,000 psi and an ultimate of 65,000. Both of these figures are consistently exceeded, and most of the material shows a yield strength over 60,000 psi. The expansion apparently causes a gain in yield strength of between 12,000 and 20,000 psi in the circumferential direction and perhaps half as much in the axial direction. The cold work also increases the ultimate strength of the metal in the circumferential direction by as much as 3,000 to 7,000 psi; this effect may not be generally known.

After being expanded, the pipe is tested hydrostatically to 90 percent of the minimum specified yield strength of 52,000 pounds. Very few failures result on this final test. The reason for making half the pipe 30-inch and half 31-inch was to permit it to be telescoped to save shipping space. It is impossible to load a cargo ship to more than a third its deadweight carrying capacity with large, thin-wall pipe. There was some consideration of telescoping three deep, but the complications seemed too great. In the beginning there were many who questioned whether a nominal difference of only an inch would be sufficient to permit easy nesting and de-nesting. It has proved to be sufficient, but another half-inch clearance would have facilitated de-nesting and have avoided some scoring of the pipe.

With pipe fabricated as outlined, the design basis for the pipe line was taken as 65 percent of the nominal yield point based on nominal thickness, stresses being computed by the conventional outside-diameter or Barlow formula. Such a procedure gives an allowable working pressure of approximately 570 psi for 30-inch pipe having a nominal ¼-inch wall thickness. When the pipe line was laid out on the basis of a minimum flow of 315,000 barrels per operating day (300,000 barrels per average day) and ¼-inch wall thickness, it was found that at least eight pumping stations would be required, but by increasing the wall thickness of the pipe at the high-pressure part of the line to a maximum of 7/16 inches, the working pressure could be increased to 885 psi, and by this move it was possible to reduce the number of stations to six. When it is realized that each pumping station is not just a small building with some pumps deriving power from a utility line, as they were on the Big Inch project, but instead means a new community out in the desert which has to be supplied with everything from the outside, this advantage can be seen in its true proportions.

The northern plains of Arabia slope gently upward from east to west at a fairly uniform rate, reaching a summit in Trans-Jordan only a little more than a hundred miles from the Mediterranean coast. The maximum elevation on the pipe line is nearly 2,900 feet at Milepost 785, but the controlling elevation for the line originally laid out was only 2,200 feet and was at about MP 1025.

At approximately MP 1032 the right-of-way plunges precipitously into a valley some 13 miles north of Lake Hula, descending to an elevation of 740 feet at MP 1042. This valley is the northern extension of the Jordan River drainage. Lake Hula drains into the Sea of Galilee about 12 miles to its south. The pipe line crosses the north end of the valley proper, although the river, still called the Jordan or Nahr el Hasbani, extends some miles to the north in a narrow and broken canyon.

From here the route crosses a spur of hills, reaching an elevation of 1,600 feet five miles from the valley floor, and again descends to the Nahr el Litani at MP 1052, elevation 700 feet. (Nahr means small river.) This river drains the Beqaa Valley in Lebanon but turns sharply westward and empties into the Mediterranean 8½ miles south of Sidon instead of entering the Jordan. The pipe line again climbs to an elevation of 1,700 feet across the southernmost spur of the Lebanese mountains, descending over 1,000 feet to the terminal in the last four miles. There is obviously an excess of pressure to be used up in this section, and it was deemed necessary for safety to have the pipe line capable of withstanding the maximum hill pressure (some 2,500 feet) under static conditions.

Although the pipe line, as indicated, was designed for six pumping stations, it began to appear after construction had actually started that a larger capacity than 300,000 barrels daily might be wanted. The heavy and light pipe was reallocated, therefore, so as to permit the addition of intermediate pumping stations which would make the total number of pumping stations ultimately twelve. This results in some unbalance when the line is operated with six stations and also results in cutting the pressure of several of the first six stations below the original design limit. As it stands now, the line will have a total capacity of 315,000 barrels per actual operating day with six stations and slightly over 500,000 barrels if the intermediate stations are added.

The picture many people have of Arabia is a wilderness of sand, with perhaps a little water hole or well here and there supporting a few date palms. This, however, applies only to a small part of the area traversed by the pipe line. Just to the north of Abqaiq where the major oil production of Arabian American Oil Co. is now located, and covering a part of the field, there are sand dunes close to 100 feet high which move southward at rates approximating 50 feet a year over a base of chert. These dunes are indeed a serious obstacle to construction, but they are almost entirely confined to the first 40 miles of the line between Abqaiq and Qatif. As a matter of fact, the moving dunes probably cover less than a third of even this section. The line here was the first to be completed and has been in successful operation for some time, handling oil to Qatif Junction, whence it is delivered to the coast for

* Condensed from a paper by S. P. Johnson, engineer, Standard Oil Company of California, presented before Petroleum Division, American Society of Mechanical Engineers, San Francisco, June, 1949.

loading ships pending the completion of the entire line.

The appearance and behavior of the sand dunes themselves is most interesting. The principal wind blows from one direction, a few degrees east of north, and this is obviously the cause of the dune formation. They have a gradual slope on the windward side and plunge into a very steep slope at the angle of repose of the sand on the leeward side, and the steep slope in plan has the form of a new moon. The sand carried by the wind goes up the windward slope not more than a few feet above the surface and drops at the top of the leeward slope when its velocity is checked by the tremendous eddy that exists on the lee side. The sand then drops on the steep slope, and since the latter is already at the angle of repose, it slides down. In this sense the dunes do not blow forward; they slide forward. They are apparently in a delicate state of equilibrium and are quite sensitive to change in conditions. Their progress can be altered, and they can even be forced to destroy themselves by a relatively small amount of work intelligently applied.

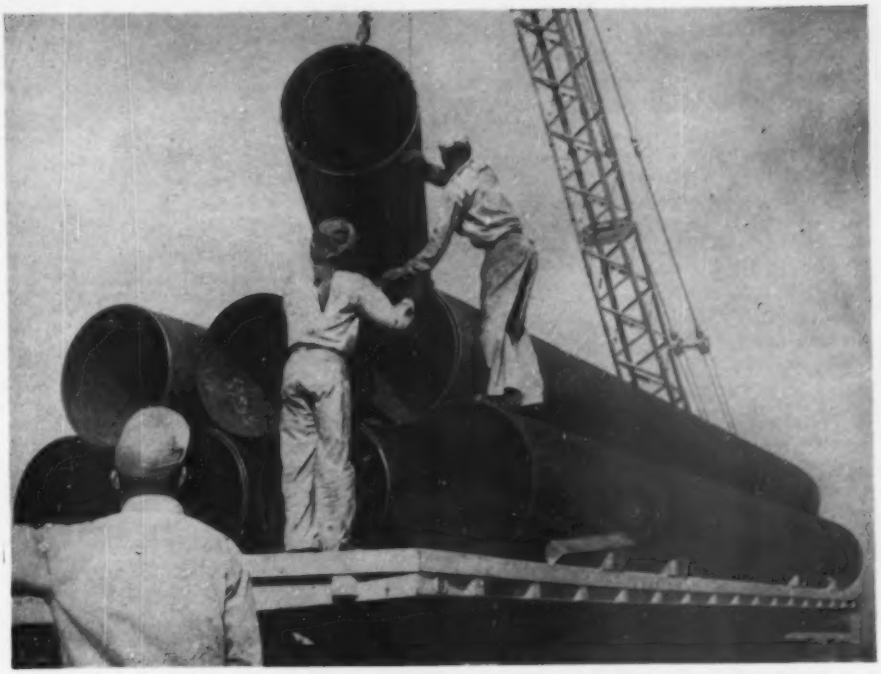
The point to be made here, however, is that the overwhelming proportion of the right-of-way is either not sandy at all or is covered with a stable sand or sandy soil which supports a growth of small bushes and does not tend to shift. This latter type of terrain, largely confined to the first 150 miles of the line, has been found excellent for pipe line construction and road building.

Farther to the west the terrain for many miles consists of flat rock and gravel plains, virtually treeless except for a few spots, but supporting an intermittent and sparse growth of grass on which the Bedouins graze their flocks of sheep, goats and camels during favorable parts of the year.

Certain portions of the plains country are extremely rough, the surface being covered with fractured stone piled up in irregular heaps, making it almost impossible for road or other construction, even though it looks fairly smooth from an airplane at an elevation of 1,000 feet. Fortunately, however, it has been possible to avoid nearly all the worst of this country by adjusting the route slightly.

When the line approaches Trans-Jordan at about MP 860, it enters the well-known Trans-Jordan lava beds. Road construction here is moderately difficult. The lava beds themselves are quite different from what one might believe from looking at the maps or from a casual examination. Much of the lava has weathered into a yellow sand, but there are large boulders covering almost the entire surface. Below the surface there is a mixture of sand and boulders. A fair road can be made by sweeping away the surface boulders, provided enough binding material can be brought in to stabilize the sand and keep it from blowing away. The subsurface boulders, however, make ditching operations very difficult.

Beyond the lava beds the right-of-way enters country which becomes more and more built-up. Occasional settlements and villages with permanent structures come into evidence. Flowing streams develop and patches of soil, carefully terraced and intensively cultivated, are interspersed with rocky hills. Beyond the lava beds the right-of-way skirts the Jebel Druse, a volcanic butte which is a landmark for miles around, and finally drops into the valley above Lake Hula.



Unloading nested 30- and 31-inch pipe from barge to truck trailer at Ras el Misha'ab on the Persian Gulf coast of Saudi Arabia. The nesting of pipe for shipment doubles the number of lengths which can be shipped in one vessel.

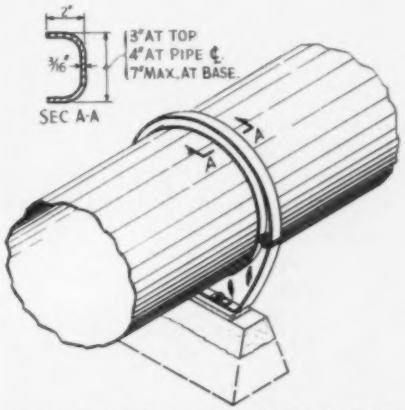


Fig. 1. Pressed steel ring girder support for 30-inch pipe line.

There is one other interesting type of country that a pipe line must cross in eastern Arabia, and that is the salt bogs known as "sabkhas." They are permanently wet and often have an almost absolutely flat surface, giving one the impression that they are natural pools of salty water that have blown full of sand, finally forming a stable surface just damp enough and smooth enough to prevent more dry sand from adhering. Sometimes the surface of sabkha is covered with loose sand of varying depth. They are always wet under the surface, and the crust may be anything from damp to very dry, depending on the location and season of the year. Sabkhas are all confined to the general vicinity of the Gulf Coast, but the pipe line crosses several of them, some of which are fairly large. They are treacherous for automobile and truck transportation, but a good road can be constructed by proper grading and by bringing in some outside material.

From the standpoint of pipe line construction, the terrain described can be classified as follows:

(1) Moving dunes
(2) Sabkhas
(3) Stable sand with small bushes, known locally as dikaka
(4) Gravel plains
(5) Rocky plains or plains with rock at varying distances below the relatively flat surface
(6) Lava beds
(7) More or less cultivated land near the Mediterranean, much of it being rocky hills.

While only the extreme westerly part of the terrain is mountainous in the sense usually understood, some of it has prompted design features that have not ordinarily been used in the construction of oil pipe lines. Where the line crosses moving dunes it has, in general, been buried. Of course the dunes were avoided as far as possible, and a good deal of work was done in moving sand to put the pipe in as stable a situation as possible, but it will have to be watched and perhaps readjusted as the sand moves. Across sabkhas the

line is supported on steel piles. The piles have I-beam caps, and the pipe is held in pressed-steel ring girders. Across stable dikaka the line is and will be buried. It will also be buried across the gravel plains where reasonable excavation by ditching machine is possible. Across rock plains three different methods of construction are being used, depending on the depth of the rock below the surface. Where the rock is deep enough to permit the line to be buried, this construction is being used in most cases. Where the rock is on the order of two feet below the surface, the pipe is laid on a well-padded support after excavating down as far as the rock, and soil is mounded over the line to hold it in place. This second type of construction will not suffice to anchor the line, and at horizontal changes in direction or vertical overbends, anchorages have to be provided. Where the rock is close to the surface or on the surface, the line will be supported a few inches above the ground at intervals of 20 meters (about 66 feet) in pressed-steel ring girders supported on small concrete pads. (Fig. 1)

The above-ground construction is of principal technical interest, since the other types of pipe line construction are well understood. As far as the supports are concerned, after study of the secondary stresses at supports, it became evident that it would be necessary to reinforce the pipe at these points in some manner, and pressed-steel ring girders were selected as the most economical method of reinforcement, being light and, in large quantities, fairly inexpensive. Static bending movements are maximum at the supports but are only moderate at a 66-foot spacing.

A second problem was that of temperature. Careful study of the effects of temperature changes indicated that the pipe line would be under no more net stress if no attempt was made to permit expansion and contraction, but if, instead, it was simply held rigidly in place, of course being suitably anchored at changes in direction. In this study it was assumed that the pipe might reach a temperature 30° higher than the atmosphere or, in other words, a maximum of 140°F. The first part of the line will be operated at 160°F maximum, the hot oil coming from a crude oil stabilizer. The temperature of installation was assumed to average 80 or 90°, less during winter, and the minimum temperature reached by the flowing oil probably not less than 40°, although atmospheric temperatures in western Arabia often go below freezing. In other words, it was necessary to figure on a range of about 100° in temperature, perhaps two-thirds or more of which might be in one direction. Every degree change in the temperature of a completely restrained piece of steel results in an axial stress of approximately 190 psi, so 70° would result in an axial stress of about 14,000 psi which, it was believed, was not excessive in view of the fact that the circumferential tensile stresses were more than double this amount. Of course the column stability of the line on supports at 66 feet was verified.

In addition to the axial stress due to temperature, there is also that due to internal fluid pressure. The latter is tension and amounts to 30 percent of the circumferential stress instead of the 50 percent that it would be with a free-floating line closed at the ends. This tension tends to offset the compressive stresses due to rise in temperature in the more highly stressed portion of the line, and it appeared to the designers that it would be helpful. The two types of failure ordinarily encountered in a pipe line are rupture of the longitudinal weld, almost invariably as the result of inherent defects or, second, having the line pull apart as the result of tension of circumferential welds made in the field. The latter type of failure would, of course, not be expected when the line was in compression.

Still another problem considered was vibration caused by the wind. There is plenty of wind in Arabia, and during the so-called shamal (meaning north in Arabic, and that is where the wind usually comes from,) period it may blow at 30 miles an hour for days at a time. The natural period of vibration of a 30-inch pipe line filled with oil and laid across 20-meter supports is about 2.6 cycles per second. The Karman effect supposedly disappears from 30-inch isolated cylinders at a wind velocity of about 20 miles per hour, at which time its exciting frequency is estimated to be between two and three cycles per second. It was realized that this result could not be applied to a pipe line close to the ground, and the decision was to lay the first part of the line, see what happened, and then do something about it if it proved to be necessary.

Up to now the line has shown some vibration, but the deflections have amounted to no more than about ½ inch by actual measurement, although offhand guesses have almost always been greater. There has been no evidence of resonance at any wind velocity so far encountered, but there has been some evidence that the line goes into free vibrations of fairly small amplitude at its natural frequency at certain times, perhaps after receiving a shock excitation from gusty or variable wind.

The portion of the pipe line that is buried, about four-fifths of the total length, will be wrapped, and cathodic protection will be applied where it seems warranted. The wrapping so far applied consists of a primer, a heavy coat of asphalt, a wrap of glass fabric, a second coat of asphalt, and finally an exterior wrap of asbestos fabric. In addition the bottom of the ditch is covered with a fabric padding to minimize the hazard of having the coating damaged before the backfill is complete. The results so far obtained with this type of coating have been very promising. Most of it has been installed in the dikaka country where the sand is stable and has a high electrical resistance, but where damp, salty, low resistance soil can be reached by excavating 10 to 20 feet. Under these favorable circumstances, a single magnesium anode dropped into the salty material has in several instances depressed the electrical potential of the pipe more than a volt for 10 or 15 miles.

It is fully realized, of course, that this extremely favorable situation will not exist in the more easterly parts of the line, and it is in fact expected that suitable low resistance spots for anodes may be difficult to obtain and that most of the protection may have to be supplied by magnesium ribbon and by anodes in deep wells at the station sites where plenty of power is available. Nevertheless, the high initial resistance of the wrapped coating so far applied furnishes a strong basis for

Fifth wheel and bolster on truck under forward end of pipe. In case a power unit becomes inoperative the load of pipe need not be removed to permit substitution of another truck.

the belief that, with a little care, corrosion of the buried section of this pipe line can be virtually prevented.

The pumping stations of the Trans-Arabian Pipe Line are of interest mainly because of their large size rather than because of any particular unusual features or departures from ordinary practice. At the time of their design a careful study was made to determine whether they should be driven by steam or by internal combustion engines, since these two sources of power were the only ones commercially available at that time. At first the use of steam appeared preposterous in a country where there is very little water and where all of that is bad. Ordinary well water in eastern Arabia usually has about 3,500 parts per million of total solids, and of this 750 parts or more is hardness. In fact the steam power plant at Ras Tanura refinery operates with water that is perhaps as bad as anything now used by a steam plant anywhere. Although well water can be obtained at varying depths nearly everywhere along the right-of-way, and although there are hand-dug wells here and there of great antiquity and sometimes remarkable depth, yet the water required for a cooling tower for a steam station would have been prohibitive. This led to the consideration of dry air-blown condensers utilizing finned tubes or other types of extended surface. It was estimated that steam could be condensed at five pounds gage pressure under the most adverse circumstances in such a dry condenser. Of course during the night and in the winter conditions would be more favorable, and it would be possible to operate a condenser under vacuum if such operation was desired. The size of condenser required turned out to be perfectly practicable. It was estimated that by operating boilers at a pressure of 900 psi and 750F, exhausting at five pounds gage, a water rate in the vicinity of 11 pounds per horsepower-hour should be obtainable. The steam plant would have the advantage of fewer operating units and much less inherent complication, but even with the water rate quoted, the overall fuel consumption would probably be 18,500 Btu per hydraulic horsepower-hour as compared to 9,500 Btu for a diesel plant. It was finally decided to go ahead with the more orthodox internal combustion engines at all of the stations except at Station No. 1 in the Abqaiq field where there is a virtually unlimited amount of surplus sour gas for fuel. Station No. 1 contains two 6,000 hp steam turbines directly coupled to two-stage centrifugal pumps, each capable of delivering about 340,000 barrels daily against a maximum of 840 pounds pressure. The exhaust from these turbines under normal circumstances will be used for heating in a stabilizer which removes hydrogen sulfide from the crude oil, but it can be alternately routed to dry air-blown condensers of the type previously mentioned in case operation of the stabilizer does not parallel pumping requirements. As a matter of possible interest it may be mentioned that the Arabian American Oil Company is just completing a 30,000 kw steam power station in the same location. This power station will exhaust to dry air-blown condensers at five pounds gage, but steam will also be extracted at 50 pounds for additional heating in the crude oil stabilizer.

Illustration to show how a wheel can clear an 18-inch obstacle without loss of traction for other wheels and without rubbing frame. Bolsters are recessed for pipe and padded. This photograph was taken before shipment of the unit. In service in the desert dual tires are used on all axles.

High-speed pumps of the type used at Station No. 1 require adequate pressure on the suction. This is provided by two vertical pumps in the tank field, each capable of delivering full pipe line capacity at about 75 psi. All the usual accessories for a modern pumping station will be used. Among these are automatic flow and pressure controls, a recording flow meter for the main stream and remote reading tank gages. Precision gaging of oil for royalty purposes in this area is accomplished by balancing the oil column against a mercury manometer which, when properly done, has been found more accurate than the conventional method of tape gaging.

The pumps at Station No. 1 are of conventional design, although they are perhaps the largest units of their type ever built. On account of the large shaft and high peripheral velocities and comparatively high pressure, packing difficulties were feared, and it was finally decided to eliminate all packing and simply to install labyrinth bushings successively bled to lower pressures and finally to a sump whence the leakage is returned to the line.

As indicated, Stations 2 to 6 inclusive will be of the conventional type, operating with single-stage centrifugal pumps in series. The pumps are driven by 1700-hp diesel engines through speed-up gears. The pumps operate at a nominal 2200 rpm and the engines at 343 rpm. The engines are of the four-cycle type, supercharged by the Elliott Buchi system. They have eight cylinders, 16-inch bore by 20-inch stroke, and are capable of operating at a BMEP of 120 pounds per square inch. There will be five pumps in series, four normally operating to meet the requirements of the line and one spare. The individual pumps are by-passed with lines containing check valves and have motor-operated suction and discharge valves. Any unit can, therefore, be started and stopped without disturbing other units.

Besides the main driving units for the pumps, there will be three electric generators, one a spare, for driving auxiliaries, including the fans of the extended-surface dry air-blown radiators that will cool the jacket water and the lubricating oil. They will supply power for all incidental uses, including air cooling of the living quarters and refrigeration. Other important auxiliaries include pumps for the water wells and an auxiliary booster pump for putting pressure on the main pump suction when it is necessary to draw oil from the station tank. These generators will be driven by six-cylinder engines having the same cylinder dimensions and other general characteristics as the engines used for pumping.

The stations are piped in such a manner that they can be operated either straight-through with "closed suction" or by floating a 96,000-barrel tank on the line coming into the station. In the latter case the electrically-driven booster pumps just mentioned are provided to raise the pressure on the suction of the main pumps enough to prevent cavitation.

It is not certain at this time to what extent the stations will be operated with "closed suction." This method of operation is almost obligatory for a products line to minimize contamination and in an ordinary crude line has advantages in permitting the dispatchers to correlate receipts and deliveries without difficult and usually inaccurate corrections for tankage along the line. However, it has disadvantages too. Unless precautions are taken to limit the results of surge pressure to one section, pressures generated by the various stations can, under certain circumstances, be cumulative

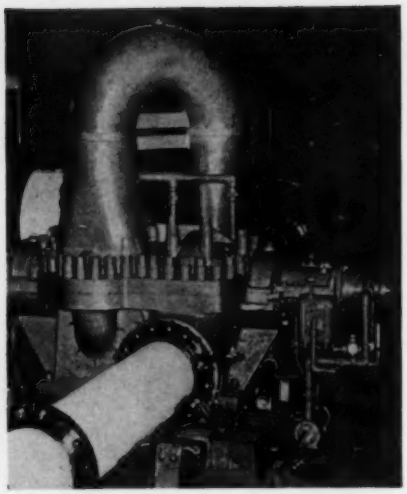
and result in over-pressuring the line. Where the line is laid above ground, there is another reason for operating with open tankage at each station that does not appear where the pipe line is buried. Since few long commercial pipe lines have been laid above ground, this phenomenon is perhaps not generally appreciated. In a line with multiple stations, each section of which is exposed to sunlight, every station receives more volume of oil during the day than is pumped, and, conversely, pumps more during the night than it receives. The difference is substantial, and if it were allowed to accumulate over 1,000 miles, it would result in a substantial loss of capacity, since the capacity of the line during the day would be limited by the last section and during the night by the first section. The magnitude of this effect is uncertain, since the exact distribution and quantity of unburied line is not yet established.

In order to avoid over-pressuring the pipe line in case of accident or faulty operation, especially when operating with closed suction, it is now contemplated that relief valves of special design will be installed on both the incoming and outgoing main lines. In addition, over-pressure trips will be installed to shut down one or more of the engines in case of over-pressure on the discharge of the station.

Conventional scraper traps are being installed. The Arabian oil is known to be somewhat waxy. The pipe lines so far operated between the field and the Persian Gulf terminals have not experienced wax deposits, probably because the oil has never had the chance to cool off in the short distances involved, but wax has accumulated in the tanks. In the higher elevations in western Arabia and Trans-Jordan the oil temperature may fall as low as 55° in the winter time. It is understood that the temperature of oil received at the Haifa terminal of the Iraq Petroleum Company falls as low as 57°F in the winter, although the annual average is a little over 70°. Scrapers, and hence scraper traps, are also of value to remove air during the filling of the line, to separate the water used for testing from the oil following, as well as to assist in removing a certain amount of rubbish which always seems to get into pipe lines during construction.

Pump and engine houses at the stations are 230 feet long and 70 feet wide, the pump room being separated from the engine room by a gas-tight firewall. As previously indicated, there will be three 800-kw generators together with a sizable air conditioning plant, a refrigeration plant and a laundry. At the present time the plans are for the construction of six dwelling houses in addition to the superintendent's house and a four-room bunkhouse for single employees. There will be a children's playground, a tennis court, a baseball diamond and a swimming pool besides a community center and an infirmary.

In addition to the housing for Americans there will be quarters for about 24 Arab families and 200 Arab bachelors. The number of these Arab quarters may serve to emphasize the statement made earlier that the cost of constructing and operating a pipe line station in the middle of the desert is something wholly beyond and apart from any mere pumping cost in terms of kilowatt hours such as one might talk about in the United States.



Oil pipe line pump two-stage volute type, 340,000 barrels daily capacity at 840 psi differential pressure, 6,000 hp at 3,600 rpm, 87 percent efficiency.

Communications along the pipe line received very careful consideration from the start, and both wire lines and various forms of radio were considered. The wire line had three drawbacks. The first was expense, and the second was exposure to various forms of damage, including either unintentional or intentional sabotage from curious or malicious bands of nomads, but the consideration that loomed most important of all was that it would not be available during construction when communication was just as urgently needed as for operation.

Very high frequency radio of the line-of-sight variety was believed by some of the radio engineers consulted to be the only type that would guarantee performance under all weather conditions, but it required towers and a supply of power at intermediate locations where no power was available from a reliable source. If unattended, such intermediate relay stations would also be subject to derangement by the curious or malicious, or those bent on pilfering. Again it was impossible to obtain the necessary equipment in time to be used in the construction program, and possibly not in time for operation of the line.

It, therefore, seemed that some form of ordinary short-wave transmission was necessary for the construction program, and that experience might indicate that it could be expanded into a permanent system that would give reasonable satisfaction. This hope was partly based on the rather remarkable performance of the low-power transmitters which the Arabian American Oil Company geologists used in automobiles transmitting at a frequency of about four megacycles. The hope for satisfactory performance of the short-wave radio has apparently been more than borne out by the experience to date.

The temporary equipment consists principally of 1000-watt transmitters at Beirut and Ras el Misha'ab, 300-watt transmitters at the main intermediate construction camps, 50-watt transmitters at temporary tent camps, and 15-watt transmitters in certain of the motor equipment. The through communication from Ras el Misha'ab to Beirut, an airline distance of 850 miles, has been almost faultless. Various frequencies can be used between three and 18 megacycles, and two are normally set up, but the change-over is manual. Communication with the 50 and 300-watt line transmitters is also excellent, and at times ever the 15-watt automobile transmitters have been able to communicate three-quarters of the way across Arabia. The latter situation is unusual and not to be depended on, but the automobile transmitters have ordinarily been able to get in communication with the nearest construction camps without difficulty.

It is contemplated that the permanent installation will consist of two more or less separate systems, one a through system from Sidon to Dhahran, and the other a dispatching system for the pipe line, taking in all the intermediate stations as well as the terminals. The through system will utilize transmitters of 1000-watt output feeding to rhombic antennas designed to obtain single-hop transmission. Three rhombic-antennas will be used for reception in conjunction with a diversity receiving arrangement which automatically selects the strongest signal and virtually eliminates fading. The dispatching system will utilize three frequencies simultaneously to provide dependable communication to any or all stations at distances varying from 125 to 1,000 miles. The frequencies will be in the vicinity of five, 10 and 16 megacycles.

At the Mediterranean terminus of the Trans-Arabian Pipe Line, which will be a few miles south of Sidon at a point where the Zahrani River empties into the Mediterranean, it is planned to install 16 tanks of 180,000-barrel capacity each at elevations 285 to 378 feet above the water. The tanks will be about 5,200 to 7,200 feet from the shore. Four submarine loading lines will extend some 2,700 feet from the beach to a point where the water is 50 to 55 feet deep, and in addition there will be separate ballast lines. The initial installation will probably be the simplest necessary for loading tankers by gravity with crude oil at a high rate, although the possibility of a refinery at this point at some later date has always been borne in mind. Incidental facilities required for a submarine loading terminal are a separator for handling oil ballast, a communication system from ship to shore and from shore to tankage for controlling flow of oil, and a small pier for the launches that are necessary for handling ships' mooring lines, transferring personnel and moving minor supplies.

The permanent radio transmitting station will be located at Sidon rather than at Beirut where the present station is, but the headquarters of the company will remain in Beirut, which is only about 30 miles to the north and is the metropolitan and commercial center of Lebanon.

WORLD CRUDE PRODUCTION BELOW 1948

Western Hemisphere Production of Petroleum is Reduced 436,800 Barrels Daily Average Under 1948 In First Half Year While Eastern Hemisphere Output Has Risen 357,600 Barrels per Day.

WORLD production of crude oil averaged 9,269,100 barrels daily in the first half of 1949. This was a decrease of 87,200 barrels daily average or a little less than one percent under the 1948 record. When compared with the first half of 1948, however, production this year has been running 214,400 barrels daily average or 2.4 percent ahead of last year.

While production of the world as a whole has not changed materially, there has been a radical realignment of the levels of output in the eastern and western hemispheres. Production in the western hemisphere in the first half-year averaged 6,838,900 barrels daily, a reduction of 434,800 barrels daily average or 6.0 percent under the average for all of 1948, and 299,900 barrels or 4.2 percent under the first half of 1948.

Most substantial reductions in crude output were made by producers in the United States and Venezuela. Because of its large supplies of heavy crude, which is chiefly suitable for manufacturing fuel oil, Venezuela suffered the greatest cut in output on a percentage basis. First half production was down 8.5 percent from the average for all of 1948 and 6.0 percent under the first half of last year. This compares with a decline in output of 6.5 percent in United States crude output under all of 1948 and of 5.4 percent under the corresponding six-month period last year.

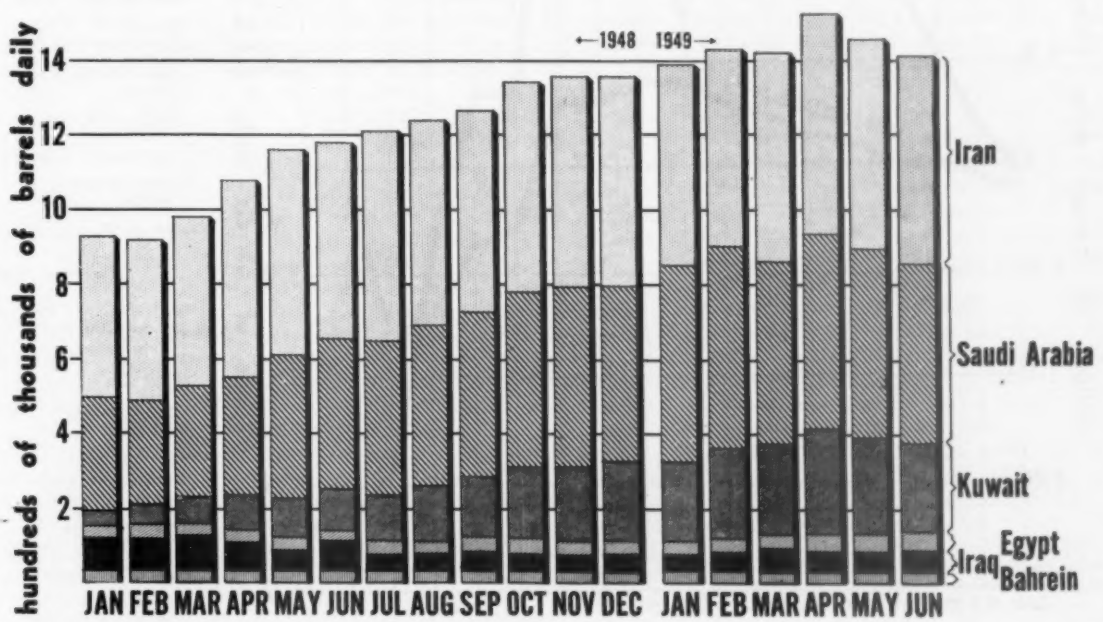
Share of the United States in the world's crude markets dropped from 60 percent in the first half of 1948 to 55.5 percent in the past six months. Venezuela's share dropped from 14.4 percent to 13.3 percent.

Venezuela production reached its peak in September and October at 1,383,000 barrels daily as distributors sought to fortify themselves with plenty of fuel oil bearing crude for the winter season. In January, when it became apparent that the fuel demand would be smaller than was anticipated, producers pinched back their wells in the heavy oil areas. The January cut was nearly nine percent to 1,245,000 barrels daily, and the downward trend continued through April, reaching a low of 1,200,000 barrels daily. May and June production jumped back 90,000 barrels daily, making the average for the half-year 1,231,000 barrels daily. Production in August was around 1,300,000 barrels daily, a little higher even than in June.

The increase in demand in the past few months has been partly an inventory situation and partly the result of improved fuel oil demand. Earlier in the year refiners at Aruba and elsewhere were liquidating their crude oil inventories on the theory that crude oil prices would seek a lower level and during the period of liquidation were buying less new oil. That operation is now completed, so a more normal purchasing policy is being followed.

Wildcatting and development drilling in Venezuela have followed about the same trend as in the United States—continuing at about the 1948 level. Venezuelan Atlantic Refining Co. and Pancoastal Oil Co. C. A. completed a successful wildcat on their Ruiz concession about 15 miles south of the Tucupido field in eastern Venezuela. On test the well flowed 800 barrels of 28 gravity oil through a 3/8-inch choke.

Colombia, the second largest producer in South America, has increased its crude output about 15,000 barrels daily average over 1948 to 81,460



The upward trend in Middle East crude oil production was halted in April and since that time output of oil in Saudi Arabia, Iran and Kuwait has tended to fall. Some further reductions are anticipated as movement of oil to the United States decreases in the last half of 1949.

barrels daily in the first half of the year. June production averaged 83,374 barrels daily exclusive of condensate. Development of present concessions in Colombia is proceeding at an orderly pace, but oil companies are showing less interest in new concessions because of high fees and taxes and some legal uncertainties. In the first half of the year only five bids were filed on new concessions compared with 32 in 1948 and 40 in 1947. At present 55 concessions are ready for granting, but applicants have made no move to sign up the final papers. To hurry things along a decree has been issued requiring the completion of deals within 90 days after approval of concessions, but even this has not produced the desired action.

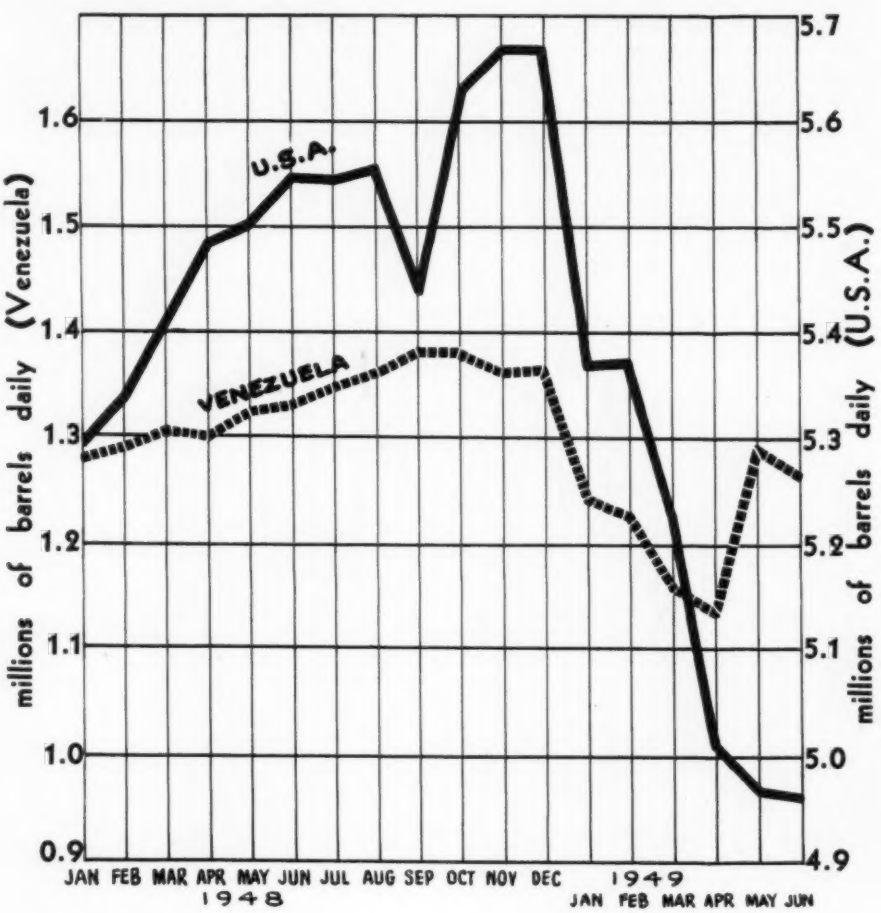
Among the countries with smaller production Bolivia has made the largest proportional increase in output. Increased drilling in the Camiri field in 1948 brought the national crude production to 1,300 barrels daily, an increase of 30 percent over 1947. An additional increase of 600 barrels daily in the first half of 1949 has brought production up to 1,900 barrels daily so that the country now is self-supporting.

Next year Chile will take its place among South American oil-producing countries with an initial output of perhaps 2,000 to 3,000 barrels daily. The government company, Corporacion de Fomento de la Produccion, has spent $10 million developing fields in Tierra del Fuego. Some 16 wells capable of producing in the Cerro Manantiales field, which has reserves calculated at 30 million barrels, are shut in at present because of lack of storage and loading facilities. These will be ready and the field will be opened to production next year.

The largest increase in production in the western hemisphere was in Canada where crude output has doubled in the past year of multiple discoveries in the Prairie provinces. Average for the first half of this year was 52,500 barrels daily compared with 28,200 barrels daily in the first six months of 1948.

Two areas in the eastern hemisphere reported substantial increases in crude output—Indonesia and the Middle East. The most important changes, of course, are seen in the Middle East where every field except Bahrein has expanded.

Production in the United States rose far more rapidly in 1948 than in Venezuela. The urge to avoid another fuel oil shortage brought peak production in November and December to a point nearly 400,000 barrels per day above the rate at which the year opened. Venezuela production rose roughly 100,000 barrels daily average between January and its peak in October. Since April of this year buying of Venezuela crude has been more active permitting an increase of about 150,000 barrels daily from the low point.



World Crude Oil Production

Thousands of Barrels Daily

	1939	1947	1948	6 Mos. 1949
North America				
United States	3,465.7	5,085.2	5,508.9	5,149.0
Canada	19.1	21.2	33.8	52.5
Mexico	162.0	159.0	159.0	158.0
Total No. America	3,646.8	5,265.4	5,701.7	5,359.5
South America				
Venezuela	567.0	1,208.0	1,342.4	1,231.4
Colombia	65.5	70.4	66.1	81.5
Argentina	51.0	60.5	63.8	61.0
Trinidad	52.8	56.1	54.9	56.0
Peru	37.1	34.8	37.5	40.0
Ecuador	6.3	6.5	7.4	7.0
Bolivia	0.6	1.0	1.3	1.9
Cuba	0.3	0.6	0.3	0.2
Brazil	—	0.2	0.3	0.4
So. America & Carib	780.6	1,438.1	1.574.0	1,479.4
Western Hemisphere	4,427.4	6,703.5	7,275.7	6,838.9
Europe				
Romania	128.5	78.5	79.5	80.0
Austria	11.7	16.9	15.0	17.4
Germany	12.3	11.6	12.3	15.1
Hungary	3.0	12.0	10.0	10.0
Poland	10.7	2.6	2.7	2.7
Netherlands	—	4.0	9.3	11.3
Albania	2.5	1.5	1.0	1.0
France	1.4	1.0	1.1	1.1
United Kingdom	0.1	1.0	0.9	0.9
Czechoslovakia	0.2	0.6	0.4	0.8
Yugoslavia	—	1.0	1.1	1.1
Italy	0.2	0.2	0.2	0.2
Europe Ex USSR	170.6	130.9	133.5	141.6
U.S.S.R.	592.0	525.0	600.0	634.0
Near and Middle East				
Iran	214.0	424.0	523.0	555.0
Saudi Arabia	10.8	246.0	390.3	508.5
Iraq	84.5	98.0	72.5	61.7
Kuwait	—	44.6	127.2	248.0
Bahrein	20.8	26.0	30.0	30.0
Egypt	12.8	25.6	36.8	44.7
Near & Middle East	342.9	864.2	1,179.8	1,447.9
Far East and Oceania				
Indonesia	170.0	22.2	87.3	120.0
British Borneo	20.0	35.6	54.0	67.0
Sakhalin	11.0	16.0	16.0	16.0
India, Pakistan, Burma	28.0	8.0	7.1	7.7
Japan	7.3	3.5	3.1	4.0
China	—	1.0	1.8	2.0
Far East	236.3	86.3	169.3	216.7
East. Hemisphere	1,341.8	1,606.4	2,082.6	2,440.2
World Total	5,769.2	8,309.9	9,358.3	9,279.1

Percent of World Crude Production

	1939	1947	1948	6-Mos. 1949
Principal Nations:				
United States	60.0	62.0	59.0	55.5
Venezuela	9.8	14.2	14.4	13.3
U.S.S.R.	10.5	6.2	6.7	7.0
Iran	3.7	5.1	5.6	6.0
Saudi Arabia	0.2	3.0	4.2	5.5
Kuwait	—	0.5	1.4	2.7
Western Hemisphere:	76.7	81.0	77.8	73.8
North America	63.2	64.0	61.0	57.8
South America	13.5	17.0	16.8	16.0
Eastern Hemisphere:	23.3	19.0	22.2	26.2
Middle East	6.0	10.3	12.6	15.6
Oceania & Far East	4.1	1.0	1.8	2.2
Europe (incl. USSR)	13.2	7.7	7.8	8.4

Middle East production in the first half of the year averaged 1,442,700 barrels daily, an increase of 262,900 barrels daily average of 22.3 percent over 1948, and of 394,700 barrels or 37.6 percent over the producing rate in the first half of last year.

Details of the rapid rise in production of the various fields in the area are shown in an accompanying chart which indicates that peak production of 1,532,200 barrels daily was reached last April. Since that time the decline in operations has been steady. July output of Arabian American Oil Co., which averaged 401,002 barrels daily, for example, is 122,000 barrels per day below April and 101,000 barrels per day below the average for the first six months. Completion of the crude contract between Anglo-Iranian Oil Co. and Standard Oil Co. (N. J.) in early August may have the effect of curtailing production in Iran or Kuwait or both, since the Jersey company has announced that the purchase agreement will not be renewed. Kuwait production for June was 239,000 barrels daily, about 41,000 barrels or 14.6 percent below the peak of 280,000 barrels daily in April.

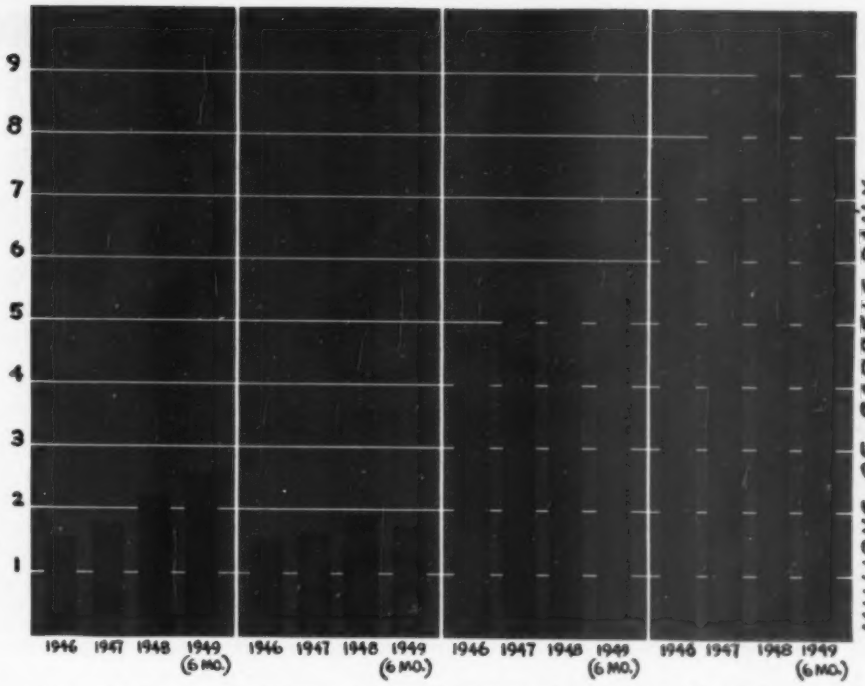
In the course of its exploratory work Aramco uncovered two new fields in Saudi Arabia during the first half of the year. Within a few days of each other in March, Aramco completed a successful well about 100 miles southwest of Abqaiq and at Fadhili about 80 miles northwest of Abqaiq. As was the case with the Ain Dar discovery last year, the new fields are not being produced at present. As of June 30 there were 74 producing and 23 shut-in oil wells in the seven known fields in Saudi Arabia. Six wells were drilled during the six-month period. Cumulative production of Saudi Arabia to June 30 is 427,341,794 barrels.

Standard Oil Co. of Egypt discovered a new field at Wadi el Feiran, some 92 miles south of Suez on the Sinai peninsula of Egypt, early in the year. The discovery was the third in the Sinai region. The two previous discoveries in 1948 have helped increase Egyptian production to nearly 45,000 barrels daily, which is not far from the level of domestic consumption.

There have been no additional discoveries in either Kuwait or Iran. Production in these countries has increased by virtue of greater exploitation of existing fields as demand has been available.

Production in Oceania and the Far East is approaching the prewar level as war damage is repaired and new drilling carried out. Indonesian production at 120,000 barrels daily is still 50,000 barrels below prewar, while British Borneo is up to 67,000 barrels daily, three times the prewar rate. The Burmah Oil Co. has struck oil at Chakwal near Rawalpindi in Pakistan to augment the present small production of that country.

European production has shown no change in total. Italy had a good deal of excitement recently when a distillate well was drilled in the



The continued increase of production in the Eastern Hemisphere while curtailment has taken place in the west has brought supply and demand closer to a balance in Europe, Africa and Asia than at any time in the past.

Po Valley where there has been extensive wildcatting. Largest producing field in western Europe today is the Schoonebeek field in Holland, which appears to be largely drilled up. Current production is about 11,300 barrels daily, which is said to be the maximum which can be produced efficiently. In 1948 the field averaged 9,300 barrels daily and in the first half-year 7,500 barrels per day. Production is shipped to Pernis for refining.

Germany has been working diligently to increase its output of crude in order to improve the country's economy. The results have been encouraging. In the first half of the year German fields have averaged 15,100 barrels of oil daily compared with 11,200 barrels in the first half of 1948 and 12,300 barrels daily for the year.

As usual data on the results of Russian operations are meager. In the present five-year plan the production goal for 1949 is 685,000 barrels daily by the end of the year. This compares with an average production rate in 1948 of about 616,000 barrels daily. Some dissatisfaction with oil production progress was expressed by Soviet leaders a few months ago, but the most recent report is that May production was four percent ahead of the goal for that month. It is estimated that production in the USSR, including Sakhalin, averaged 650,000 barrels daily in the first half of 1949, an increase of 54,000 barrels daily or nine percent over the first half of last year. Increase over the average for 1948 is estimated at 34,000 barrels daily or 5.5 percent.

The trend of drilling activity follows the trend in oil demand and oil production, but there usually is a log of some months. For the first half of 1949 the number of active rigs in the United States was actually a little higher on the average than in the same months a year earlier, although there was a downward trend in the summer which was a little more steep than the normal mid-year seasonal dip.

A report on drilling activities issued by the American Association of Oilwell Drilling Contractors shows that the number of rigs in active operation in the United States during the seven months ending with July averaged 2,095. This compares with an average of 2,089 working during the corresponding months of 1948. Reports to the association indicate a probable increase in drilling activity during the remainder of the year. In Canada there has been a very large increase in drilling. The current total is nearly double that of a year ago.

In Latin America there has been a reduction of roughly 10 percent in drilling operations in the past few months, with the largest declines seen in Venezuela, Colombia and Argentina. As is true in the United States, an increase is anticipated soon because of the upturn in current demand.

Current estimates of the U. S. Bureau of Mines are that domestic demand for petroleum in the United States will increase to 6,435,000 barrels daily in the fourth quarter. This would be an increase of more than 1,000,000 barrels daily average over the second quarter and of nearly 700,000 barrels daily average over the current quarter. Even allowing for a considerable stock reduction, this demand level will permit a considerable increase in crude production.

J. H. SHEEHAN has been appointed to the newly created post of sales manager of all petroleum sales by Lion Oil Company. He formerly was assistant to the vice president in charge of sales.

U. S. EXPORTS-IMPORTS UNDERGO CHANGES

Increase in imports of foreign oil to meet demand which did not materialize have created a stir in the industry. Independent producers are demanding action by Congress to limit imports.

AT the present time oil imports are the subject of active discussion in the United States, largely as an outgrowth of conditions that originated nearly two years ago. At that time the rapidly growing demand for petroleum products was pushing refineries close to capacity. The severe winter of 1947-48, leading to a heavy consumption of fuel oil, reduced supplies to a dangerously low point, and temporary local shortages were reported from various places. To build up stocks and guard against a recurrence of the difficulty in the following season, imports from the Caribbean were stepped up and for the first time appreciable amounts of oil from the Persian Gulf entered the United States.

It so happened that the winter of 1948-49 was the mildest the country had experienced in many years. As a consequence the use of heating oil was less than anticipated. At the same time a recession in the country's industrial activity was reflected in a slackening of the rapid rise that had been under way in consumption of all petroleum products. Stocks rose steadily, and prices of certain products, fuel oils in particular, began to decline.

In response to the change in market conditions, domestic production of crude was progressively reduced during the first six months of 1949, by five up to nearly 10 percent as compared with the final quarter of the year preceding. Receipts from abroad, however, did not decline correspondingly but averaged slightly over 600,000 barrels daily during the first half of 1949 as against a 1948 average of 512,000 barrels.

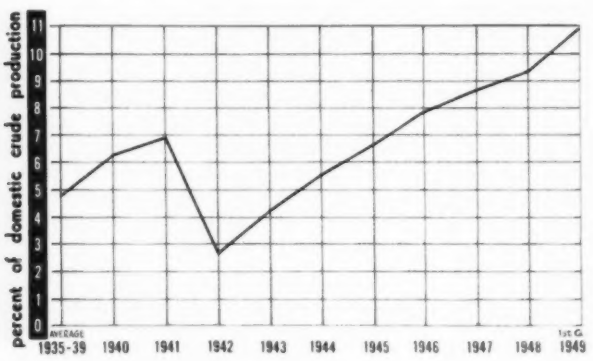
These imports, so eagerly welcomed in early 1948, have drawn the fire of the Independent Petroleum Association of America and of various local associations, which argue that under existing conditions every barrel of oil imported means one barrel less than can be domestically produced. They want restrictions placed upon the quantity of oil of outside origin admitted to the United States, and various proposals aimed at accomplishing this result have been placed before Congress. One of these, advanced by Senator Thomas, of Oklahoma, which has received the support of many of the advocates of restriction, is a proposed amendment to the bill extending the reciprocity agreements act now on the Congressional calendar which would limit the imports to five percent of domestic demand. Other suggestions have been an increase in tariff rates or authorization to the Tariff Commission to propose increases whenever imports reach a "peril point" as affecting the domestic industry.

There is widespread opposition, however, to the regulation of imports by the national legislature. Those who vividly recall the alarm that prevailed as recently as 1947 and 1948 over a possible shortage maintain that a five percent limit on imports might prove seriously embarrassing to the country's industry, should such a condition recur. They contend that any kind of limitation that Congress might adopt would introduce an element of inflexibility into the supply situation that might prove inimical to the national interest and that the whole matter had best be left to the interplay of competitive conditions. The reply of those who seek legislative restraints is to point to the rise in the import movement during recent months and to assert that continuation of this growth will operate to discourage exploratory activity and the building of larger reserves in the United States.

The policy of the American oil industry as a whole expressed through its representative body, the National Petroleum Council, is that imports should supplement and not displace domestic production. This has been generally interpreted as recognizing that imports for certain special purposes are necessary and economically desirable. So long as imports did not exceed exports, little vocal opposition to their admission was heard, but during the latter part of 1948 and the first half of the current year when statistics indicated a substantial excess of imports over exports, the claim was raised that they were impinging upon territory that should be reserved to domestic producers, at least at long as they are able to satisfy its requirements.

Even as to the facts in relation to this matter there are differences of opinion. The figures contained in the accompanying Table I and illustrated in Figure 1 are those published by the U. S. Bureau of Mines and the Department of Commerce. In a statement before a Congressional subcommittee, however, Eugene Holman, president of Standard Oil Co. (N. J.), asserted that such departmental statistics did not fully reflect the movement of oil products to points outside the United States. Specifically he stated that some 70,000 barrels daily of fuel oil brought into the country in bond to bunker ships in foreign trade, while counted as imports, were not included among exports. Neither did they include bunkers to foreign ships from domestic supplies which were consumed abroad nor military purchases shipped abroad, some of which went to foreign civilian use. Bunkers supplied to ships sailing to foreign ports averaged about 183,000 barrels daily during 1948, and shipments overseas by the military establishment were 92,000 barrels daily. Taking these factors into account, it appears that shipments of oil products for consumption outside the country exceeded imports by about 230,000 barrels daily and to that extent were derived from domestic production.

Eighty percent of oil imports into the United States come from the Caribbean area, from Venezuela, Netherlands West Indies, Colombia and Mexico. Practically the only product imported is residual fuel oil which is received from the



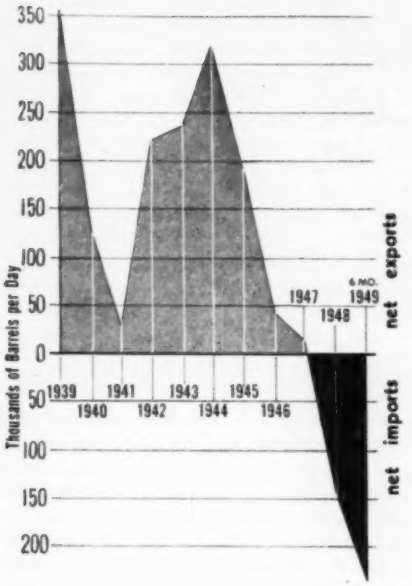
Imports of crude petroleum and products have been at a rising rate in relationship to United States domestic crude production since 1942.

Table I

U.S. Imports & Exports of Crude & Products
1939 - 1948
(Thousands of Barrels Daily)

	Imports			Exports			
Year	Crude	Products	Total	Crude	Products	Total	Excess Exports
1939	91	71	162	197	320	517	355
1940	117	112	229	141	216	357	128
1941	139	128	267	91	207	298	31
1942	34	65	99	93	228	321	222
1943	38	136	174	113	298	411	237
1944	122	130	252	94	477	571	319
1945	203	108	311	90	414	504	193
1946	236	134	370	112	302	414	44
1947	267	170	437	126	325	451	14
1948	353	160	513	109	260	369	(144)
1st Half 1949	427	173	603	83	285	368	(235)

( ) Indicates excess of imports over exports.
Source: U. S. Bureau of Mines



Net exports of petroleum and products from the United States disappeared in 1948 with the post-war shortage scare and imports have risen sharply since. The chart does not consider oil sold to ocean ships for bunkers as exports as some elements in the industry consider proper.

Netherlands West Indies and is manufactured from Venezuelan crude. The heavy base crudes from the Caribbean are depended upon by eastern refiners for their requirements of residuals, and from the viewpoint of conservation it is considered preferable to utilize them for this purpose and to use domestic crudes for gasoline and other light products. While daily receipts from Venezuela and Netherlands West Indies during the first half of 1949 have shown an increase of 7.4 percent over the average for 1948, an analysis of the heavy fuel situation* indicates that with normal weather conditions anticipated present supplies of residual fuels are not excessive and will be needed to meet the requirements of rising demand.

Although the great bulk of imports to the United States comes from Latin America, the chief concern of those who are seeking official action to stop the inflow of outside oil appears to be fear of future large imports from the Middle East. Mid-Eastern oil did not figure materially in import figures until the second half of 1948. Daily average receipts during the final six months of that year were 109,000 barrels, and this figure

Table II

Sources of U.S. Imports
(Thousands of Barrels Daily)

	1948	1st Half 1949
Venezuela	256	260
Neth. West Indies	147	173
Colombia	24	29
Mexico	15	19
Middle East	67	119
Others	3	3
Total	512	603

Imports from Middle East reached substantial volume, 109,000 barrels daily, only in second half of 1948.

* World Petroleum, August, 1949.

Table III

U.S. Imports in Relation to Domestic Production
(Thousands of Barrels Daily)

Year Average	U.S. Crude Production	U.S. Imports	Imports % of Crude Production
1935-39	3,207	153	4.8
1940	3,697	229	6.2
1941	3,842	267	6.9
1942	3,799	99	2.6
1943	4,125	174	4.2
1944	4,584	252	5.5
1945	4,695	311	6.6
1946	4,749	370	7.8
1947	5,085	437	8.6
1948	5,509	513	9.3
1st Q. 1949	5,330	580	10.9

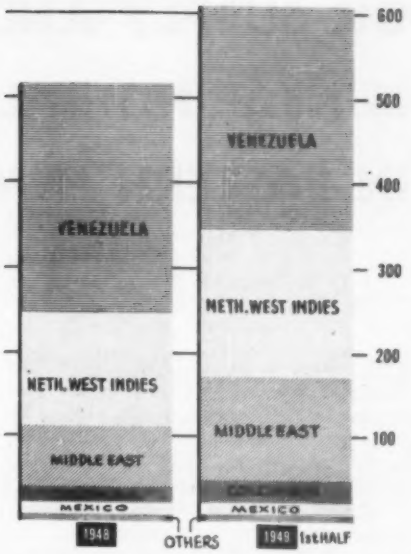
Source: U. S. Bureau of Mines

rose to 119,000 in the first half of the current year, an increase of approximately 10 percent.

In answer to criticism that importers of Middle East crude had not reduced shipments to the United States during the past several months in step with the slackening in demand, as did domestic producers, some of the importers have pointed out that these shipments were made under agreements concluded many months ago when it appeared that such receipts would be needed to meet demands of the American market and that such agreements could not be broken off summarily. In line with this position Standard Oil Co. (N. J.) announced a few weeks ago that a contract under which it had been receiving shipments of oil from Kuwait had just been completed and would not be renewed. Two of the large producing companies in the Persian Gulf area have substantially reduced output within the past few months and it is anticipated in the trade that shipments to the United States from that area will show a material decline over the next few months.

General opinion in international trade circles is that oil from the Middle East is not likely to figure in an important way in the American market, at least not in the early future. It is obvious, however, that it will supply an increasing share of European requirements as the extensive program of refinery construction in European countries takes form. It is pointed out that the American companies operating in the Middle East all have interests of still greater importance in the United States and would hardly be disposed to flood that market with oil, even if they were in a position to do so.

In Washington there has been considerable discussion of oil imports, but the prospect of early action by Congress is regarded as doubtful. A subcommittee of the House Committee on Small Business has conducted some few hearings on the subject and has sent out a 36-point questionnaire to a large number of firms asking the extent of their importing operations and the reasons therefor. The State Department also is conducting an inquiry into the import plans of major companies over the coming year. The National Petroleum Council decided to take another look at the subject and has appointed a committee of 24 to conduct a fact-finding study. This committee, however, is definitely barred from suggesting "plans or recommendations" in view of the "competitive aspects of the problem," the Council evidently having in mind that any proposal looking to a restriction of competition might expose its members to attack under the anti-trust law.

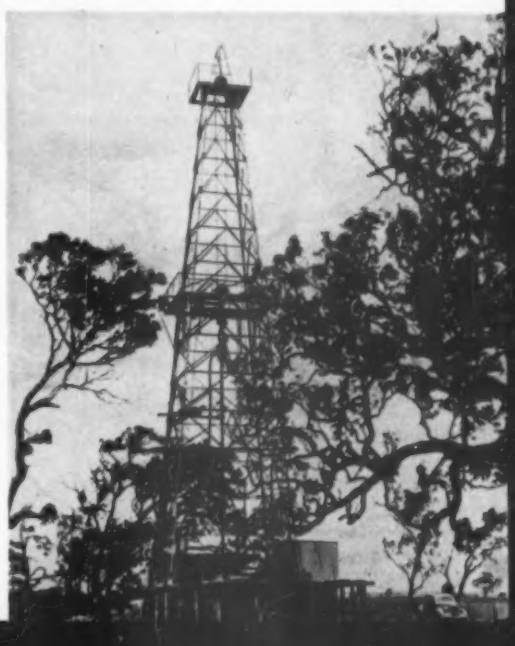


Analysis of imports into the United States during the first half of 1949 compared with the previous year to indicate changes in source.

Australian Oil Search

Pictured below is a drilling rig operating at Lake Kokyora in the vicinity of the Lake's Entrance field, East Gippsland, Victoria. The field is producing about 10 barrels daily of crude with a high lubricating oil content and is the only production in Australia except the shale oil produced in New South Wales.

Shell (Queensland) Development Ltd., has embarked on an extensive exploratory campaign in Australia since the war. As a result of geological and geophysical studies as a well location has been staked north of Roma in the great artesian basin of Queensland. This is scheduled to a be a deep test. Ampol Petroleum Co. also is planning a deep test in western Australia.



OIL SUPPLY AND DEMAND IS NEARING BALANCE IN EASTERN HEMISPHERE

THE postwar shift in world oil trade channels has proceeded at an accelerated rate during the first half of 1949 as the eastern hemisphere began to approach a balance in supply and demand for the first time in history. It is now clear that the eastern hemisphere can supply its own oil requirements, except for special products, without making its traditional demand upon western oil. Indeed the eastern hemisphere has a considerable surplus available for export to the west, given the shipping facilities to move it.

The magnitude of the shift in world trade brought about by development of the Middle East may be seen from the following comparison of net movements of oil from the western to eastern hemispheres in the first half of this year when compared with the past two years and with 1938, the last full year of normal oil trade before World War II.

Demands on western hemisphere fields have been cut in half in the past 18 months as the flow of Middle East crude has been increased to Europe, Africa and the Far East, the principal areas in the world today in which there is a very large shortage of locally-produced petroleum. Combined oil deficiency in these three areas in 1948 was 1,344,000 barrels daily.

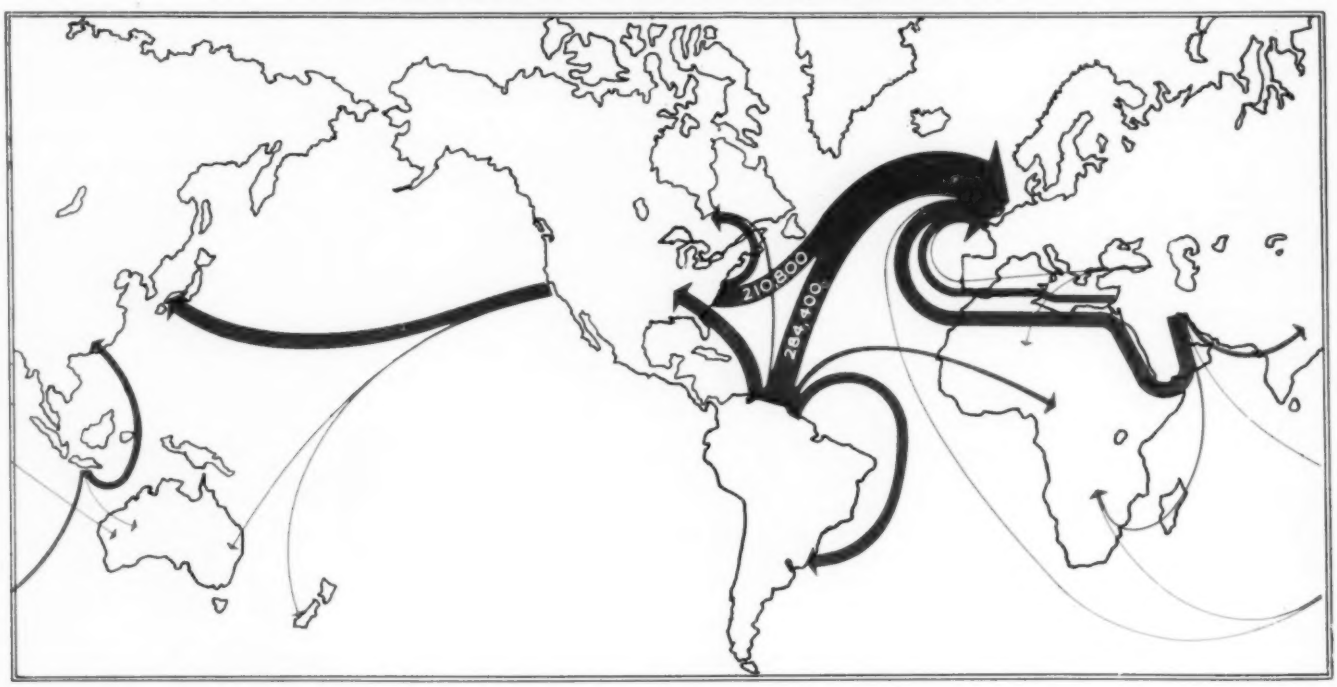
Year	Eastern Hemisphere Net Imports, Barrels Daily
1949 (6 mos.)	292,000
1948	391,000
1947	705,000
1938	688,000

It is the market for petroleum in Europe, Africa, the Orient and Oceania for which tomorrow's surplus oil will compete. In the Far East production is increasing at a more rapid rate than is demand, so that Europe and Africa remain the principal battleground for business. Assuming that the United States supply of oil will be kept approximately in balance with demand on an over-all net basis in the next few years, the competition narrows down largely to Venezuela against the Middle East. In 1948 both areas had about the same volume of surplus oil to offer deficient countries. The Middle East produced about 960,000 barrels more oil daily than it could consume, and fields in the Caribbean had a surplus of about 975,000 barrels daily after taking care of adjacent South American markets.

Latin America has an advantage currently in its own refineries, those in the West Indies and in the United States, plus a relatively short sea-haul to Europe and west Africa. These advantages will tend to disappear in future years when new European refineries are completed and the projected pipelines across the Arabian desert are put into service to reduce delivery costs of Middle Eastern crude to Europe and North Africa.

Even with the current transportation costs in favor of Venezuela, the Caribbean has lost business to the Middle East in the first half of this year. The flow of oil from the Persian Gulf and the eastern Mediterranean to Europe has increased from 573,000 barrels daily in 1948 to about 800,000 barrels daily in the first half of 1949. Latin American oil movement to Europe has decreased.

In 1938 the United States shipped 134,000 barrels of oil daily from California fields to the Orient and Oceania. Mid-Continent fields sent 211,000 barrels daily to Europe. Latin America sent Europe 284,000 barrels daily, and the Middle East supplied 175,000 barrels daily.



Local demand for oil in South America is increasing at a satisfactory rate in some countries. Venezuela itself is prosperous, and oil consumption is running about 28 percent ahead of last year. The country's demand is not large as compared with Argentina, however, and in that country economic conditions have caused a drop of about one percent in first half demand to about 140,000 barrels daily. Chile has been having even worse troubles, with the result that consumption is off about 11 percent to 18,000 barrels daily. As against these decreases, Brazil has had an increase of 15 percent in demand. Colombia, Bolivia, Cuba and other countries with good increases in demand have brought about an overall growth of about 10 percent in the South American market to about 633,000 barrels daily.

Economic conditions in Canada quite often parallel those in the United States, and at least in the case of oil consumption the current trend in the two countries is similar. Reports for early months indicate an increase of about five percent in utilization to an average of about 287,000 barrels daily. Canadian production is rising rapidly as a result of major discoveries in the Prairie provinces, but the Dominion still has a deficit of about 235,000 barrels daily and is still one of the best oil customers of the United States and of Latin America. In-shipments from these two sources averaged about 254,000 barrels daily last year. Canada will be able to reduce its imports much more when projected pipelines from the west to the head of the Great Lakes are laid.

Oil consumption statistics usually are much less current than production figures, with the result that most current estimates of demand are based on partial reports for the first quarter only. Shipments give an idea of trends, but there is always an inventory factor to consider. In Great Britain, for example, oil arrivals in the first half-year were up about 13 percent to 2.5 billion imperial gallons, but releases were about 2.1 billion gallons, with the result that inventories rose at least 400 million gallons.

Analysis of the source of British imports in the first half of the year reveals the extent of the shift in trade. Last year in the first half 60.9 percent of the oil received in the United Kingdom came from Latin American and Caribbean sources. This year the percentage has dropped to 33.8. The loss in sales suffered by western hemisphere sellers in the first six months was at the rate of 528 million imperial gallons per year (15 million barrels). At the same time in-shipments from the Middle East rose from 30.7 percent of the total in 1948 to 42.2 percent this year.

Imports of oil and oil products into France during the first half of 1949 are reported as 6,169,000 metric tons (247,438 barrels), an increase of 62 percent over the corresponding period of 1948. The increase was particularly marked in imports of crude, over 80 percent, while receipts of petroleum products declined, reflecting the growth of French refining capacity during the past year.

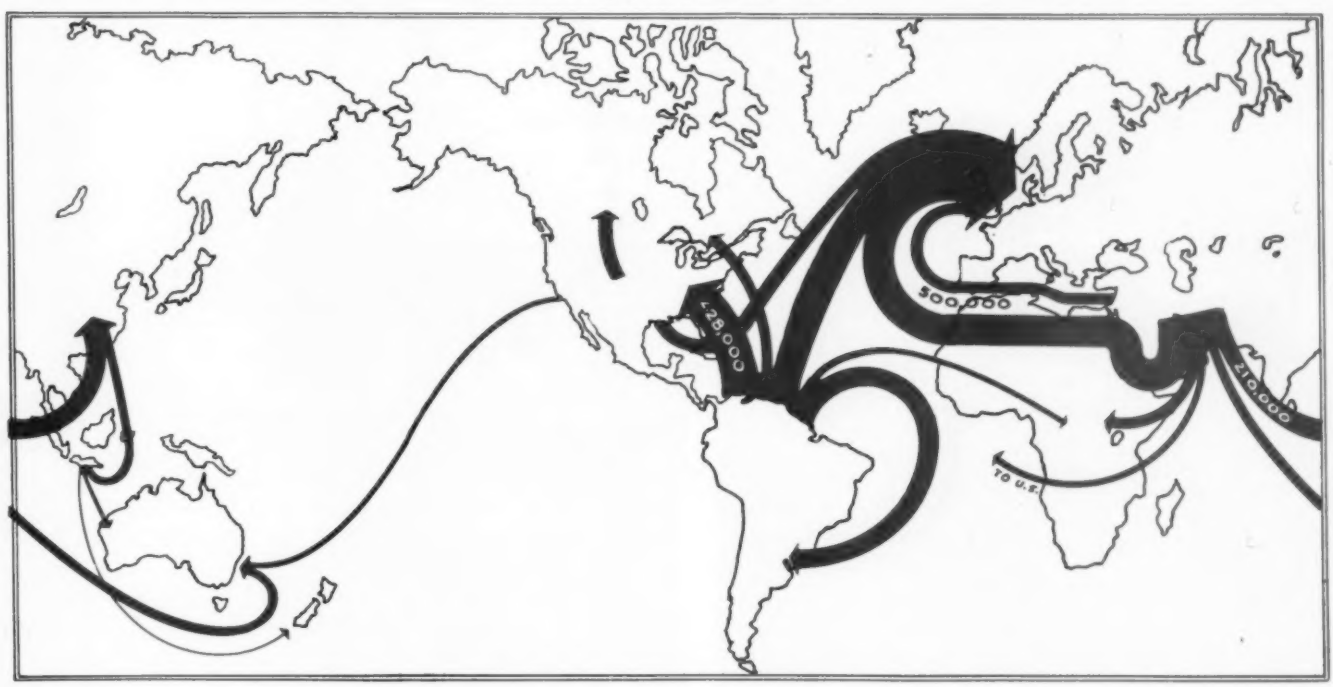
Fuel oil demand in some European countries has been exhibiting the same decline shown in the United States. Imports of fuel into the United Kingdom declined 23 percent in the first five months of 1949. Irish fuel imports were down 13 percent. Gasoline demand was sharply higher as suggested by an increase in British imports of 20 percent and Irish imports of nine percent.

European consumption for the current year is expected to show an increase of about eight percent over 1948, if economic conditions do not take a turn for the worse. The present tendency of government as well as of oil industry economists is to estimate consumption at slightly lower levels than was anticipated a few months ago. Marshall Plan nations have estimated that their consumption of 280 million barrels in 1947 will be up to 343 million barrels in fiscal 1949 and 363 million barrels in fiscal 1950. In the three succeeding years an annual increase of eight percent is anticipated by OEEC. The Economic Cooperation Administration on the other hand estimates fiscal 1949 consumption at 335 million barrels and fiscal 1950 at 356 million barrels, with future years showing a six percent annual rise.

Demand for petroleum in Africa and in the Middle East appears to be about 11 percent higher than last year. In the Orient business is spotty. Japan and Indonesia are increasing their oil consumption much faster than other countries. In Indonesia consumption is running 22 percent ahead of 1948, and in Japan the increase is 19 percent. In Siam demand is double that of last year, while India and adjacent countries have an increase of only five percent.

Based on the data at hand, it is estimated that world oil consumption in 1949 will approximate 9,800,000 barrels daily, as compared with 9,305,000 barrels daily in 1948.

In 1948 the flow of petroleum from the California fields to the eastern hemisphere had decreased to about 27,000 barrels daily, and Mid-Continent fields were supplying only 93,000 barrels of oil daily to Europe. The drop in American exports to Europe was made up by the increase in shipments from the Middle East. The increase in Latin American production was largely coming to the United States.

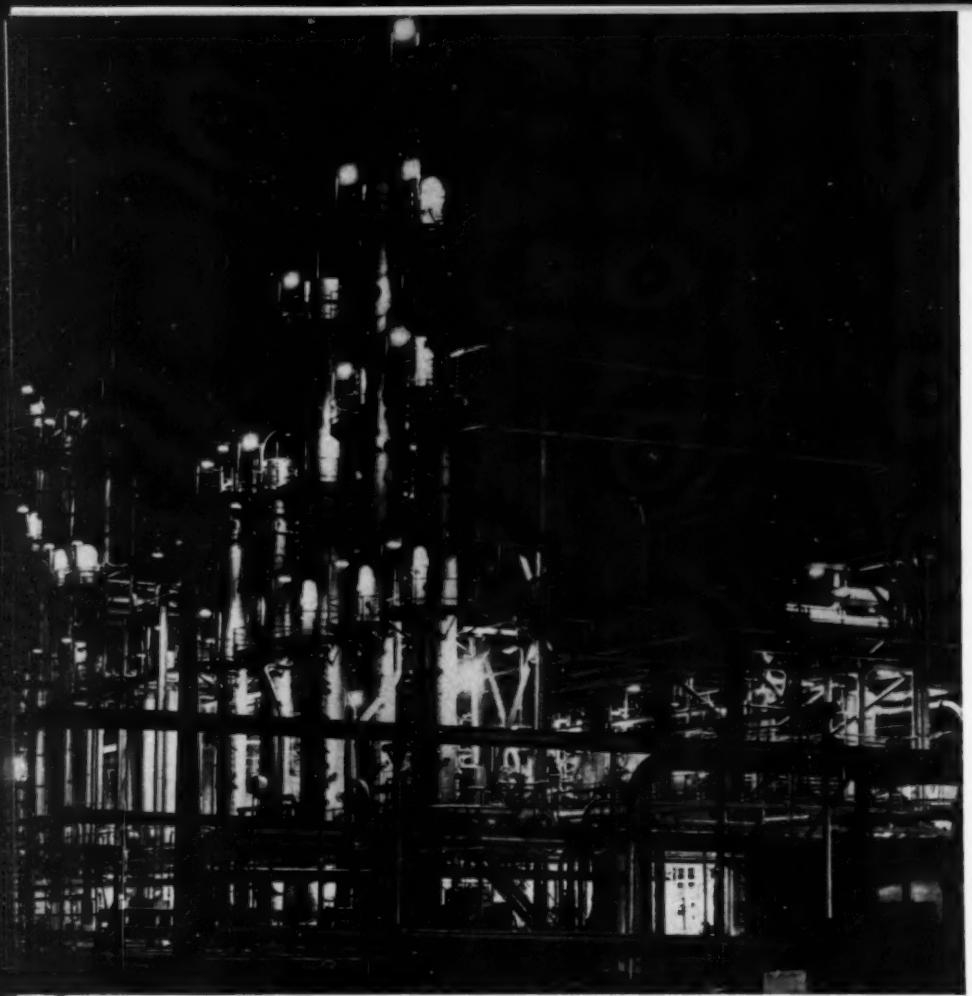


PETROLEUM

By E. Lawson Lomax

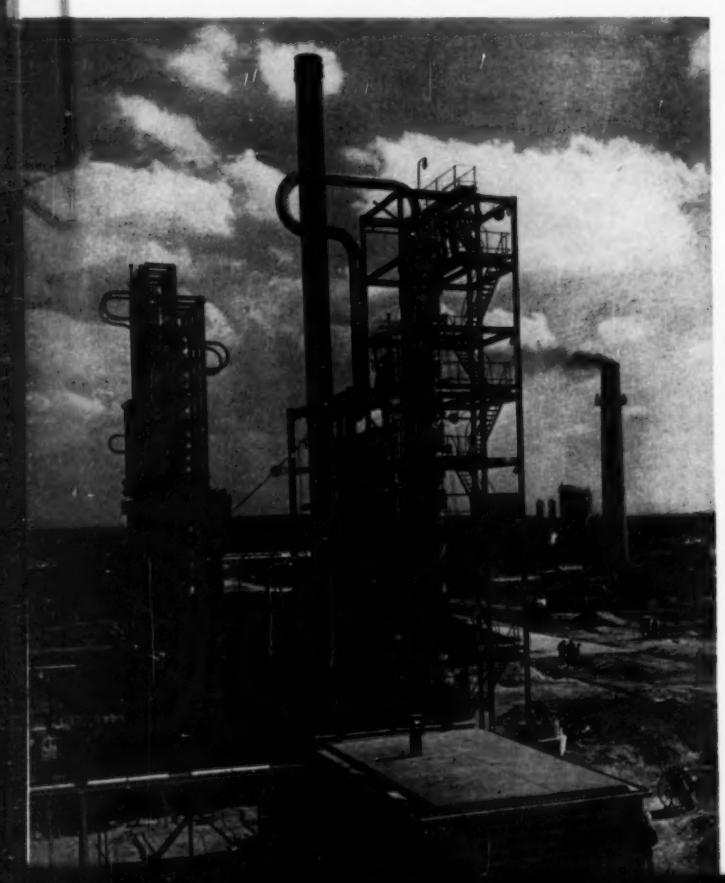
DEVELOPMENT of the petroleum chemical industry in Great Britain is an important auxiliary to the rapidly expanding refining industry, and in many cases the two lines are being carried out conjointly and are interrelated in their ramifications. While this development has not been as rapid as that which has taken place in the United States, it can be confidently anticipated that it will come to play a greatly increased part in the country's general chemical manufacture and in certain lines probably will become of greater importance than its sister industry of chemicals from coal tar.

This will particularly be the case in the supply of many of the industrial solvents which in the past have been obtained mainly from the American petroleum chemical industry. A number of industrial groups have either commenced manufacture of chemicals from petroleum or have considered the matter to be of sufficient importance and to provide enough probability of satisfactory financial return so that they either have commenced the erection of plants or have begun the planning of such factories.

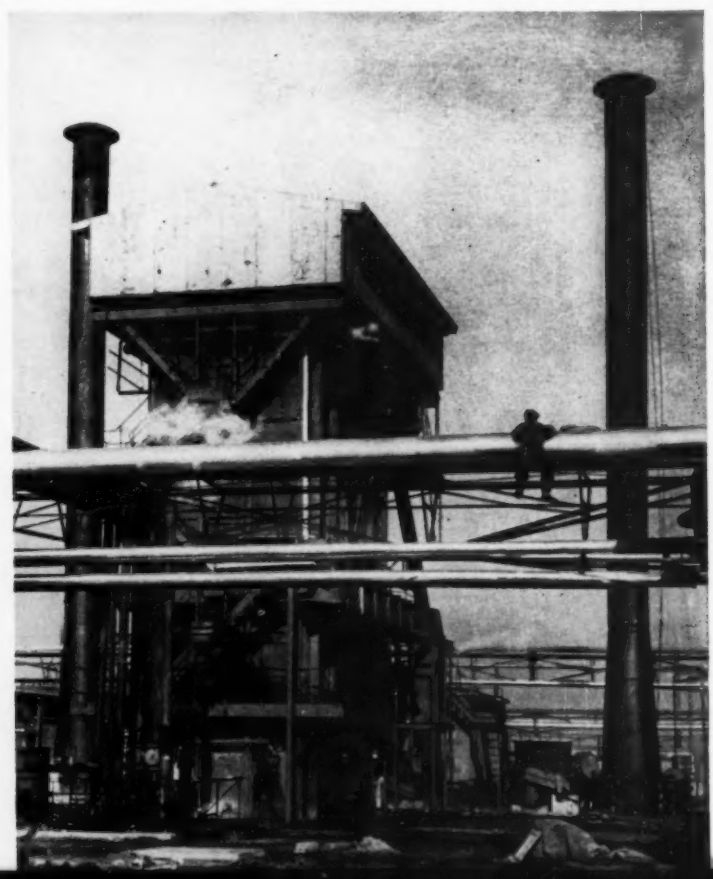


← Hydrocarbon fraction unit at the new Shell chemical plant at Stanlow, near Chester, England. Shell photo copyrighted.

↓ Atmospheric/vacuum distillation unit, with the fractionating towers of the azeotropic distillation unit in the background at Partington chemicals plant of Petrochemicals Ltd.



Catalytic cracking unit at the Petrochemicals Ltd. plant at Partington, near Manchester, which was placed in operation early this year.



CHEMICALS IN GREAT BRITAIN

The two works already in operation are those of the Shell Chemical Manufacturing Co., at Stanlow, Cheshire, and those of Petrochemicals, Ltd., at Partington near Manchester, where this company is producing basic chemicals from petroleum by the Catarole process. Imperial Chemical Industries, Ltd., is erecting a petroleum chemical factory at Witton to supply basic chemicals to its chemical manufacturing plant at Billingham. British Petroleum Chemicals, Ltd., a joint undertaking of the Anglo-Iranian Oil Co., Ltd., and the Distillers Co., Ltd., have a plant under erection. Philblack, Ltd., is at present erecting a plant in South Wales, and Cabot Carbon, Ltd., a plant at Ellesmere Port, both for the production of carbon black from petroleum.

These plants are all scheduled to deal mainly with the production of basic chemicals, extracted from petroleum either by decomposition and subsequent separation of the decomposition products, or by separation only. But the manufacture of other chemical products such as detergents, plasticizers, sulfonates, etc., from the actual fractions of petroleum is also being carried out in conjunction with refinery operations in the refineries. Shell Marketing & Refining Co., Manchester Oil Refining and the Pumpherston Works of Scottish Oils Ltd., a subsidiary of the Anglo-Iranian Oil Co., Ltd., are already producing these types of chemicals.

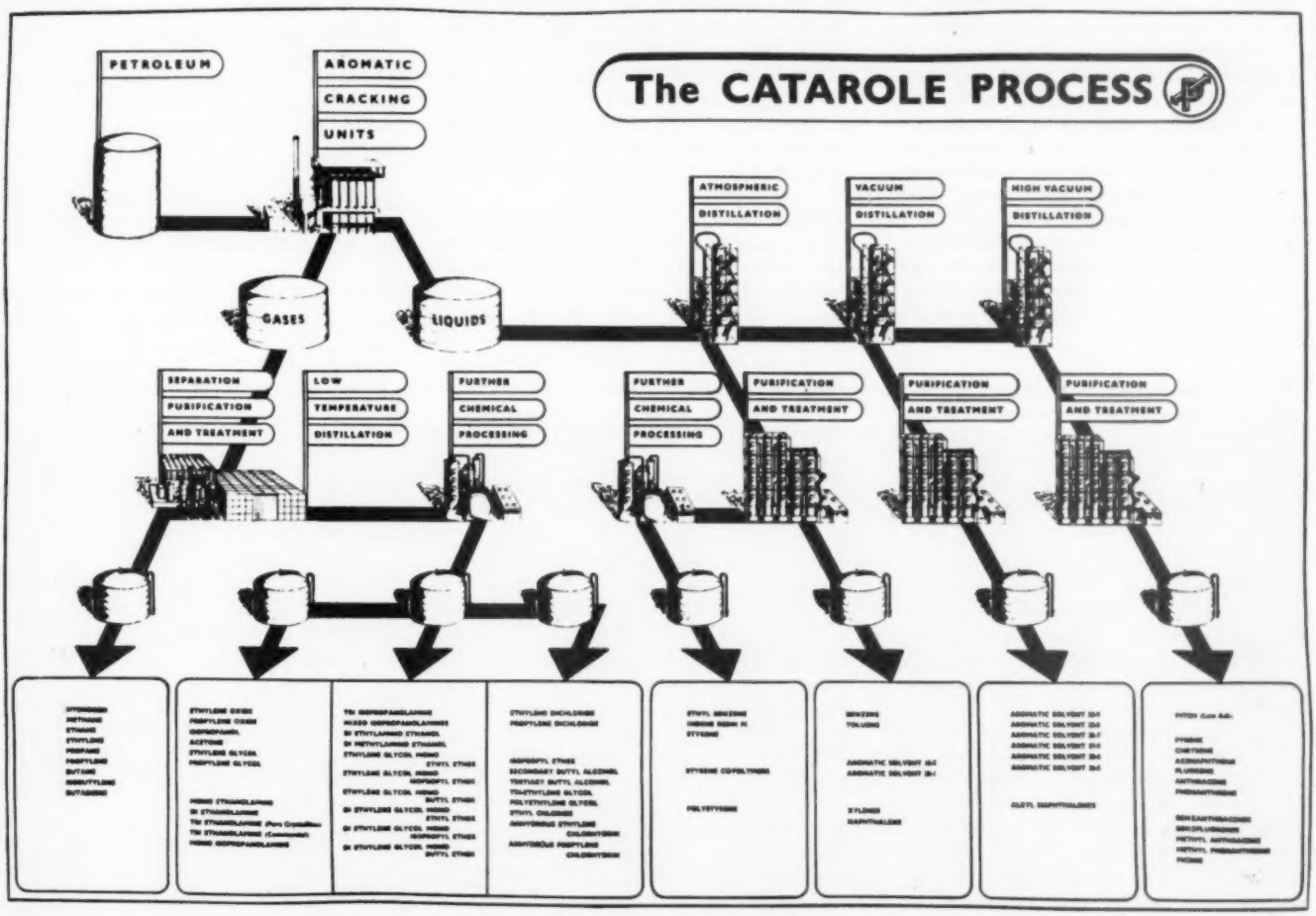
The cases of Imperial Chemical, Ltd., Philblack Ltd., and Cabot Carbon Ltd., are somewhat different, as the policy of these companies is to use petroleum as a basic material in their chemical manufacturing operations.

Official opening of Shell's new £4 million chemical plant at Stanlow, Cheshire, which has been erected on a site adjacent to the large petroleum refinery of the Shell Petroleum Co., Ltd., was scheduled for July 20, with Sir Stafford Cripps officiating, but was postponed at the last minute in view of the Royal Proclamation of a State of Emergency. This postponement did not affect the plant which was in full operation at that date. It represents the culmination of years of painstaking research and development within the group.

Up to the present most of Britain's organic chemicals have been manufactured either from indigenous coal by distillation or from imported molasses or other carbohydrates by fermentation processes. This supply has been augmented by direct imports of finished products, both natural and synthetic, from hard currency areas, and although restricted, sufficient quantities of American petroleum chemicals have been allowed into the country to stimulate keen interest in their potential use in British industry and in their manufacture from petroleum produced in sterling areas, thus saving imports of raw and finished products from hard currency areas. Expansion of refining operations in Great Britain under the extensive program set up will provide ample feed stock from normal refining processes.

It is not surprising that the Shell petroleum chemical plant should be one of the first to come into operation, since the Shell organization has pioneered developments in the United States in the manufacture of secondary butyl alcohol and methyl ethyl ketone from butylene, isopropyl alcohol and acetone from propylene, as well as derivatives such as diacetone alcohol, methyl isobutyl ketone and methyl isobutyl carbinol.

Flow diagram and list of chemicals to be produced by the Catarole process of Petrochemicals, Ltd.



Production of these chemicals from petroleum has been a triumph of chemical engineering skill. In the past chemicals have been manufactured mainly on the "batch" principle, particularly in some of the smaller chemical factories in Great Britain where, until recently, nothing much more advanced than the "stick and bucket" method has been employed.

In modern methods of manufacturing chemicals from petroleum, entirely new continuous plants based on the most advanced chemical engineering knowledge have been designed, where automatically controlled operating conditions which are impossible to obtain in batch operation are the rule, thereby enabling a high standard of purity to be maintained at high production rates, the productivity per worker being among the highest in any industry in the United Kingdom.

It can safely be said that the production of chemicals from petroleum is a direct outcome of the scientific and technical skill and research which has been employed to develop the petroleum refining industry to the high status it now enjoys, for the technique employed in the petroleum chemical industry is in many respects identical with that employed in the parent industry.

The plant itself consists essentially of a thermal cracking unit together with units specially designed to deal with the cracked products by fractionation at sub-zero temperatures and under atmospheric or increased pressure, hydrogenation, dehydrogenation, desulfurization, polymerization, synthesis and distillation, as well as by reactors and converters. The basic raw material for the plant is gas oil, which is cracked under carefully controlled conditions of high temperature and low pressure to give a high yield of hydrocarbons containing three and four carbon atoms. These fractions include a very high proportion of olefins which form the feed stocks for the manufacture of solvents and other chemicals produced at Stanlow. The liquid hydrocarbons are transferred to the petroleum refinery for admixture in its general stocks.

The new refinery, with a capacity of 2.5 million tons per year of crude oil from non-dollar sources, will, when completed, provide these feed stocks without the necessity of special cracking, and thus a complete integration of refining operations and chemical manufacture will be achieved.

The separated C_3 and C_4 hydrocarbons, which have been desulfurized, are allowed to react with sulfuric acid of definite strengths and at optimum controlled temperatures, when the unsaturated hydrocarbons are absorbed, forming alkyl esters, while the saturated hydrocarbons pass through unchanged and are used as fuels. The alkyl esters are hydrolized for the production of their respective alcohols which are then separated from the acid by steam stripping and finally purified by distillation. By heating to high temperatures in specially designed equipment, the alcohols are dehydrogenated to give the corresponding ketones together with hydrogen in a high state of purity suitable for hydrogenation reactions. The products of dehydrogenation are separated in a state of 99-percent purity by distillation.

The range of solvents at present being produced at Stanlow is:

From propylene: (C_3)	Isopropyl alcohol
	Isopropyl ether
	Acetone
	Diacetone alcohol
	Mesityl oxide
	Methyl isobutyl ketone
From butylene: (C_4)	Secondary butyl alcohol
	Methyl ethyl ketone

These products are of three types: ketones, alcohols and ethers, each having many industrial uses. Acetone is widely used as a solvent in making lacquers, dopes, photographic films, explosives, drugs and pharmaceuticals. As a raw material it is used for the manufacture of chloroform, synthetic perfumes and plastics, including methyl methacrylate, for thermoplastic resins.

Methyl ethyl ketone is largely used in the petroleum lubricants industry and is a useful raw material for synthetic perfumes, rubber accelerators and ketone-formaldehyde resins. Methyl Isobutyl ketone can be used for the purification of penicillin and is also a valuable chemical intermediate.

One of the most important uses for diacetone alcohol is the manufacture of hydraulic brake fluids. It is one of the few organic materials which offer complete miscibility with castor oil at high and low temperatures, with a low freezing point and non-corrosive action. It also has a minimum effect on the rubber parts of the brake mechanism. Being completely miscible with water, it is of interest as a solvent for dyestuffs.

Isopropyl alcohol is useful in the food processing industry as a dehydrant for starch and gelatine and as a precipitant in the extraction of pectin from citrus fruits; it is also used as an ingredient for perfumes, toilet waters and hair tonics. Secondary butyl alcohol is an intermediate in the preparation of secondary butyl xanthate for use in oil flotation and in the synthesis of dyestuffs, flavorings and perfumes. The above are only a few of the applications of petroleum chemicals but are sufficient to show the immense possibilities of this new branch of organic chemical manufacture.

This side of the petro-chemical industry may be classed as the synthetic one, but there are many other products made from petroleum which come under the classification of chemicals. One of the most important classes is that of detergents, which contribute to the alleviation of the world shortage of fats for human consumption. One ton of petroleum hydrocarbons can produce sufficient detergent to replace more than two tons of edible fats in soap manufacture, so the Shell Company's detergent, "Teepol," of which the ultimate production at Stanlow is scheduled at 75,000 tons per year, is helping to butter the nation's bread, being equivalent to about two ounces per week per head of the present population.

Petroleum-derived chemicals also help to increase agricultural productivity through the application of petroleum-derived insecticides, fungacides and soil fumigants to fight against crop pests. Seen against a background of rising population and increasing demands on available food supplies, Britain's new industry is a vital asset in the survival of European economy.

Although the Stanlow plant is intended primarily to meet home demands, a part of the production should be available to earn valuable currency for the British economy. The extent to which other countries will take advantage of the availability of these new chemical solvents will depend not only on the supply and demand position in the United Kingdom but also on whether sterling is available to the importing countries, and on the extent to which solvents are now derived locally from indigenous coal, molasses and other commodities.

The new project, it is expected, not only will assist certain countries, particularly those participating in ERP, in their efforts to withstand the world dollar shortage, but will also further the aims of ECA by providing the raw materials for existing and developing industries in western Europe and other markets.

Petrochemicals, Ltd., is erecting a large factory at Partington near Manchester, part of which already is in production, in which the Caterole process, developed by Petrocarbon, Ltd., is employed for the catalytic cracking of certain petroleum fractions into liquids and gases which are further processed to yield finished chemicals. The cracking unit has been in operation for some months now, during which time the teething troubles inseparable from a new process of this type have been overcome, and current results are reported as exceeding early expectations. The accompanying diagram shows the chemicals produced from petroleum by the Catarole process.

A large portion of the uncondensible gases, which from their composition will be seen to be of high calorific value, are at present being piped direct to the Manchester Corporation Gasworks, where they are utilized to blend with the town's gas supply to raise the calorific value and, incidentally, to reduce the coal requirements. The liquid products given by the Catarole process are essentially highly aromatic and are readily purified by normal processes to give pure aromatic hydrocarbons on distillation.

The plant, which when completed is estimated to cost $16 to $20 million, has been completely designed and engineered in Great Britain, and many novel designs and processes specially developed for this plant have been embodied in it, some of which might well be classed as of a revolutionary nature. The use of these new ideas and designs has generated a somewhat conservative outlook on the project, and the authorities are withholding full publicity of the results until they are absolutely certain of the fundamental facts. Sufficient information, however, is available to enable one to make the assumption that this plant constitutes a definite advance in the knowledge of the manu-

facture of petrochemicals and will eventually be able to supply in bulk chemicals which in the past have existed only in the pure state as research laboratory specimens.

The production of chemicals from petroleum by Imperial Chemical Industries, Ltd., is part of the postwar program of this company in its £17 million ($68 million) project for Teeside, northeast England. For this purpose the company has acquired a site of some 4,000 acres on the Wilton estate in northeast Yorkshire, on the opposite side of the River Tees to the company's present large chemical works at Billingham. Primarily this project is intended to develop the heavy organic side of the British chemical industry on a scale adequate to the national needs; in addition an electrolytic chlorine-caustic soda plant will be erected and a variety of plastics produced.

Although this company is primarily interested in the manufacture of chemicals, both organic and inorganic, yet in the past it has carried out extensive developments of the Bergius process for the hydrogenation of coal and coal tar products and, owing to this, has for many years been a producer of motor fuels of high octane value, which were distributed by the major companies. It was also a participant during the war, along with Shell and Trinidad Leaseholds, Ltd., in the operation of the government Trimpell refinery at Heysham for the production of high octane aviation fuels.

The selection of a suitable site for this vast program was not an easy matter, requiring as it does ready access to supplies of salt, coal and water, together with road, rail and sea facilities, as well as suitable locations for the healthy housing of the large personnel required. The site chosen supplies all these necessities.

Development work is proceeding well on the new site; construction of stores, workshops and boiler plant, which will service all operations, is well advanced, some of the plant for the production of plastics being in operation. The plant for the manufacture of chemicals from petroleum is in an advanced state of erection, as is the provision of a tunnel 1,750 feet in length under the Tees, connecting the Wilton and Billingham works for the transfer of gases and liquids from one works to the other.

The value of petroleum as a raw material for the production of various organic chemicals is well established, giving as it does products which may be purified more easily than those made in the past from other materials. It can really be classed as the most versatile material known for this purpose. In the petroleum industry generally the production of fuels, lubricants and illuminants is the major object, with the production of chemicals as a side issue, even though one of great importance. On the other hand, the major object of ICI is the production of chemicals from petroleum, with fuels as a minor issue. In this, however, the company holds a somewhat advantageous position, as the motor fuel produced as a by-product at Wilton by cracking is complementary to that made at Billingham by the hydrogenation of coal or creosote. Each fuel has special qualities, and their blending will be advantageous.

The plant being erected at Wilton for the production of raw materials for petroleum chemicals is of the type familiar to all oil men and has been engineered by the M. W. Kellogg Company. It consists of a thermal cracking unit of 250,000 tons per year feed capacity, the feed for which will be the nonal type of petroleum distillate, and it will be run for a high yield of C_3 and C_4 gases, with motor fuel and other liquids as secondary products. Auxiliary distillation plant and low-temperature distillation plant for the separation of liquid and gaseous hydrocarbons in a high state of purity, ready for further operation, are being installed.

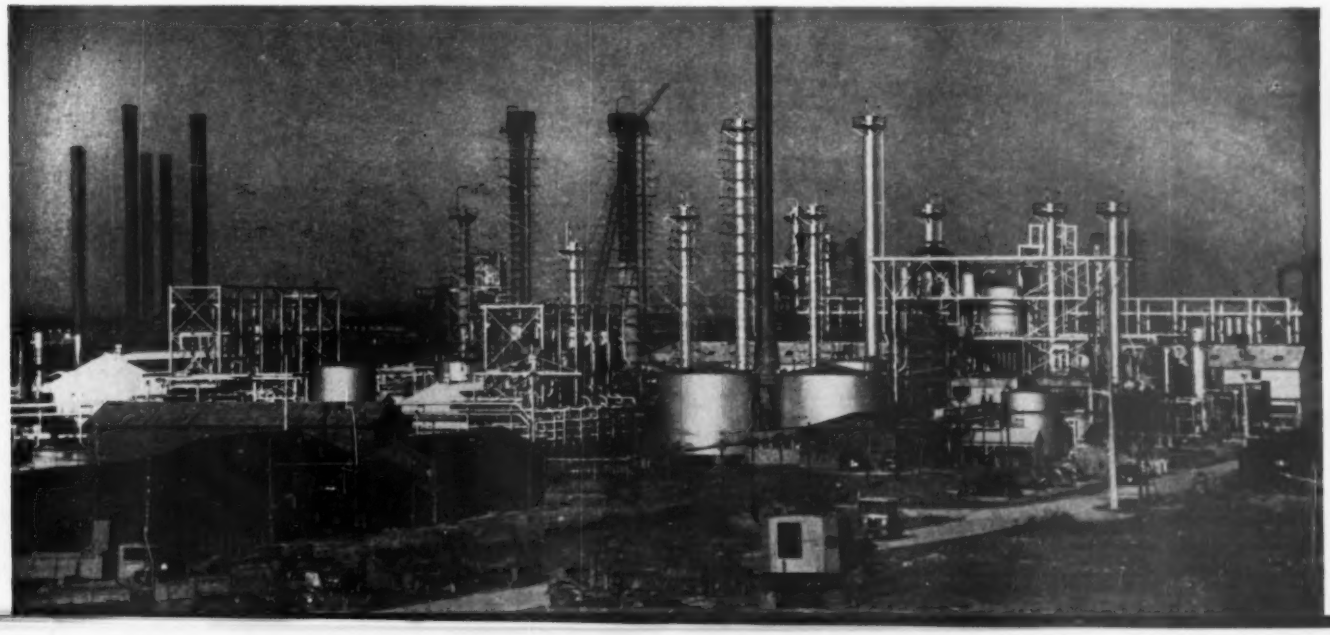
At present the program for chemical production covers the manufacture of polythene, ethylene oxide, isopropanol and acetone used in the production of "Perspex;" but the future program covers the supply of many organic chemicals such as solvents for paints, cellulose lacquers for cars, saccharine, drugs such as aspirin and the sulfonamides, the anti-malarial "Paludrine," the raw materials for plastics and fibers such as nylon, as well as dyestuffs.

British Petroleum Chemicals, Ltd., is a joint undertaking of the Anglo-Iranian Oil Co., Ltd., and the Distillers Co., Ltd. It is erecting a plant for the production of chemicals from petroleum at Grangemouth, Scotland. At the present time the company is not publishing any information as to the capacity of the plant or the chemicals which it proposes to manufacture, but no doubt it will be erected on lines similar to those of the Shell plant at Stanlow and eventually will be closely coordinated with the Grangemouth refinery of Scottish Oils Ltd., subsidiary of the Anglo-Iranian Oil Company.

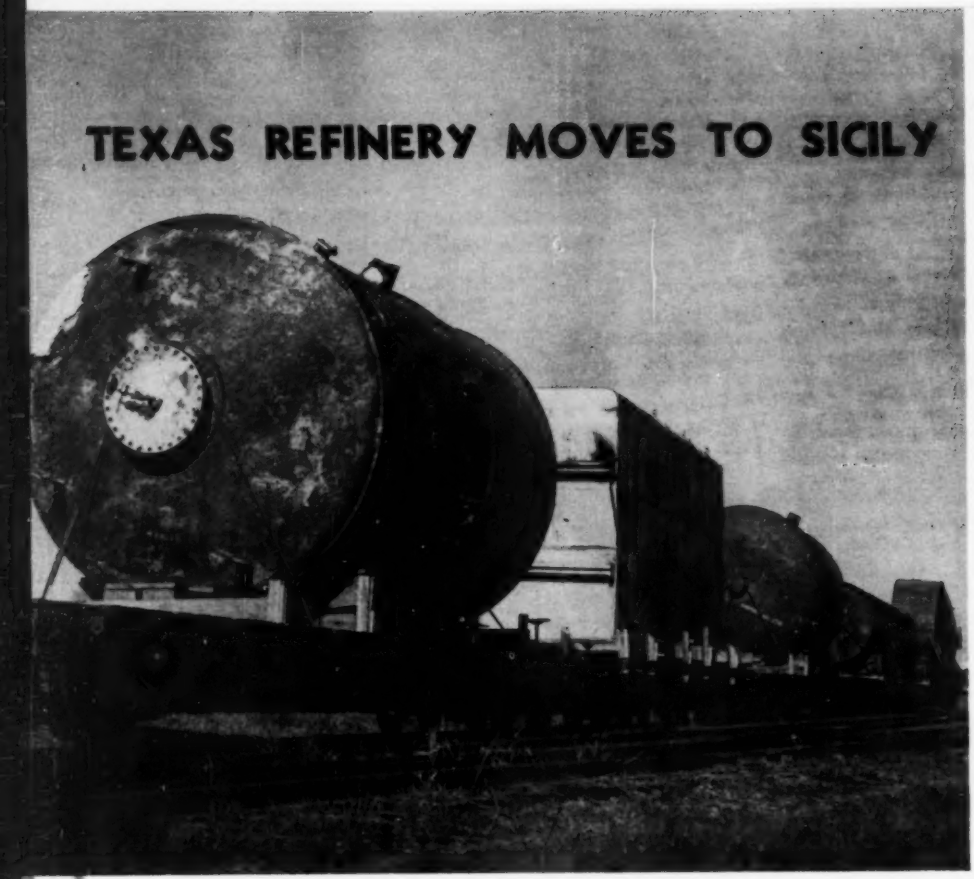
Under the auspices of Philblack, Ltd., a plant for the production of carbon black is being erected in South Wales. The carbon black will be produced from a petroleum distillate by the Phillips process. The cost of the plant is estimated to be £8-£900,000 ($32 to $36 million), and the immediate program envisages the production per annum of 20 million pounds of Philblack grade A and 30 million pounds of grade O. This total may eventually be increased to 55 million pounds. Raw material for the process will be gas oil, conforming to definite Conradson coke and aniline point specifications.

Cabot Carbon, Ltd., a subsidiary of Godfrey L. Cabot Inc., Boston, U.S.A., is erecting a carbon black plant at Ellesmere Port to work on the Cabot process. The plant is scheduled to produce 10,000 tons of carbon black per year from petroleum and is expected to be in operation in about two years. It is the first plant to be built under the ECA investment guarantee program, whereby arrangements are made for conversion of profits to dollars for 14 years or until the investment has been repaid.

General view of the newly completed Shell chemical plant at Stanlow. This photograph was taken by Shell photographers in February, 1949, during construction of the plant.



TEXAS REFINERY MOVES TO SICILY



Five carloads of dismantled equipment ready to move to Houston.

TRANSFERS of refineries from one site to another, though infrequent, are not so unusual as to attract great attention. At the present time, however, something new in this field is being presented, with a fully equipped refinery in process of making a transatlantic voyage from Texas to Sicily.

The plant involved in this transition, until now located at Longview in the famous East Texas field, was formerly owned and operated by Danciger Oil and Refineries Inc. It was built for that company in 1936 when East Texas was approaching the peak of its development. It went on stream in April of that year and continued in operation until November 1938 when it was closed, the refining business at that time being in a somewhat depressed state. In the early part of World War II the plant was overhauled and a number of improvements added. It was reopened in July 1944 and continued to run until September 1945. Since that time it has remained inoperative. Thus, although the refinery has been in existence 13 years, its equipment has been in use for only 34 months.

In the latter part of 1948 Raffinerie Siciliane Olii Minerali S.A., of Milan, Italy, was seeking to establish a medium size refinery in Sicily. Being unable to place a contract for construction of a plant at an early date, the company's representatives began looking for an idle refinery that could be acquired. Upon inspection it was decided that the Danciger plant, a combination topping and thermal cracking unit of 7,500 barrels daily capacity, would meet requirements with some additions. Prior to this time the plant had been purchased from the Danciger interests by International Trading Syndicate of Tulsa, which, therefore, became the principal in its sale to the Italian company, the transaction being arranged through Industrial Overseas Technical Corporation of New York.

Following its acquisition of the property, Raffinerie Siciliane Olii Minerali, or RASIOM, as it is more simply designated, entered into a contract with Universal Oil Products Company covering a paid-up license for use of the thermal cracking process and providing for services in process design, inspection and consultation. The next step was to arrange for dismantling of the Longview plant. This was taken in February last when RASIOM contracted with Delta Engineering Corporation, of Houston, for the complete job of disassembly, preparation of the equipment for shipment and loading for delivery to shipside for its ocean voyage. The contract also called for mechanical design, preparation of drawings and purchase of new materials and equipment.

After the contracting company had assembled the necessary machinery, including such heavy construction equipment as a 100-ton guy derrick, mobile cranes and heavy trucks, and a crew, which, at the peak of operations, consisted of 125 men, work was begun on March 15, 1949. Care had to be exercised in disconnecting and removing refinery parts; machinery had to be cleaned and treated to put it in condition for shipment. Repairs had to be made where needed and other modifications, such as the installation of corrosion-

Crane lowering 6-foot diameter by 135-foot stack at Longview refinery site.

resistant linings in vessels, had to be performed. The amount of equipment handled included 54 pressure vessels, 42 heat exchangers, 86 pumps, 60 storage tanks with a capacity of over 200,000 barrels, 128,000 fire bricks, 73,000 feet of piping, water tube boilers, heaters, compressors and 1,350 valves—a total weight of 3,400 long tons.

Of special importance was the preparation of drawings of each constituent part and the match-marking of the package or crate containing it in order to avoid confusion and to facilitate the work of reerection. There were 2,500 such packages, some of them mounted on skids for more convenient handling. All equipment connected with the refinery except wooden buildings and cooling towers was included in the shipments. Transportation of the many crates and packages to the steamship pier in Houston was mainly by truck, but some of the larger and heavier pieces were moved by rail. Altogether the shipments comprised 255 truck loads and 20 railway car loads.

Throughout the dismantling process a representative of the Italian engineering firm, Sindicato Tecnico Impianti Industrial (STII) of Milan, was stationed at the plant to observe operations. STII is to have charge of the erection of the plant on its arrival in Italy. Another of its engineers followed the preparation of mechanical design and drawings at the Delta Engineering Corporation's office in Houston.

The process of dismantling and preparing the refinery equipment for shipment covered a period of one hundred days. Final items were loaded on trucks and freight cars for removal to Houston on June 23. At Houston a former 10,000-ton Liberty ship now under Italian registry as the "Giacomo Fassio" had been chartered by RASIOM. Loading of cargo was completed in three weeks, and the ship sailed on July 3 for Syracuse, Sicily.

Ultimate destination of the refinery is Augusta on the southeastern shore of Sicily. At this location it will have the use of underground storage installed by the Italian navy in the form of eleven tanks of 60,000 barrels' capacity. The plant will operate on sour Middle Eastern crude which will be unloaded from tankers at Augusta for processing. The design is based upon 10,000 barrels per day of 37° API Abqaiq crude, and the following is a tabulation of estimated products:

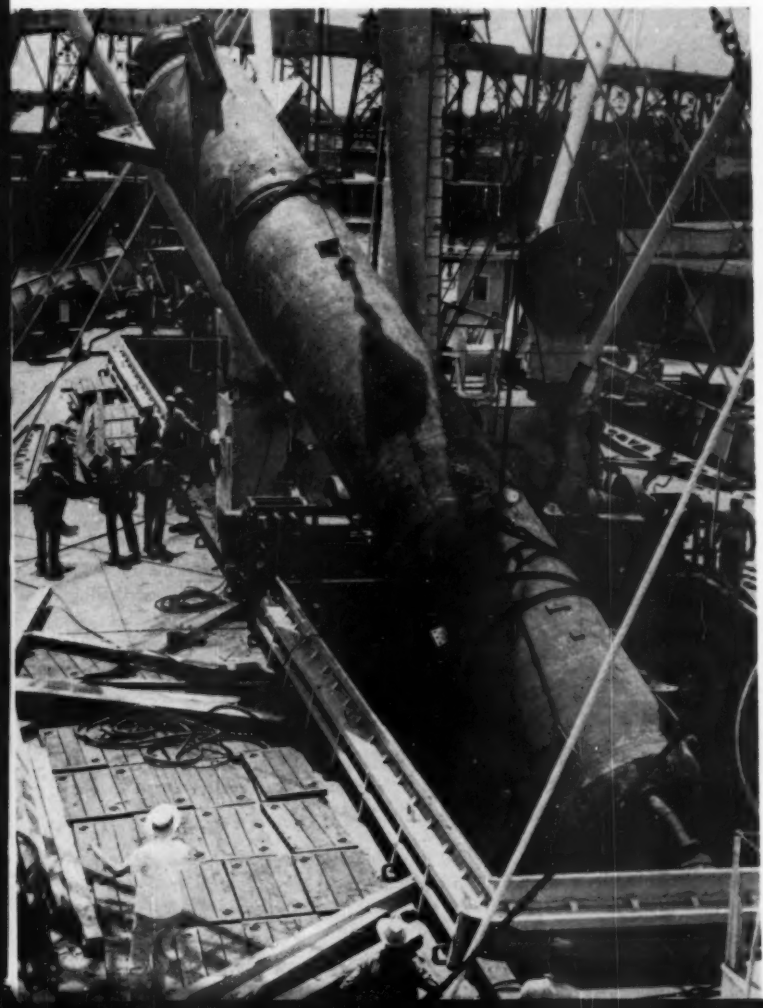
Product	Vol. %
Straight run gasoline	28.0
Cracked gasoline	14.2
White spirits (Naphtha)	4.0
Kerosene	10.0
Diesel fuel	14.0
Cracked residuum	26.6
Gas and loss	3.2
	100.0

Equipment is being added to recover LPG from the refinery gas. The gasoline will be leaded, and the equivalent of housebrand and premium motor fuels will be produced. A portion of the kerosene will be specially treated for use as DDT spray, which is consumed in large quantities in the lowland areas of southern Italy.

As it is expected that a large percentage of the products will be consumed in Sicily, tank car and truck loading facilities will be installed for local distribution. In addition, tanker loading docks will be available for water shipments to the mainland of Italy and other points.

Cooling water will be drawn from Fiume Marcellino, a small river emptying into the Mediterranean near the refinery site. After passing through heat exchange equipment, this water will be discharged downstream. Low-pressure exhaust steam from process pumps will be utilized to drive condensing turbines on the light oil heater recycle charge pump and on a 700-kw generating unit. An office and living quarters for plant employees will be erected at the plant site.

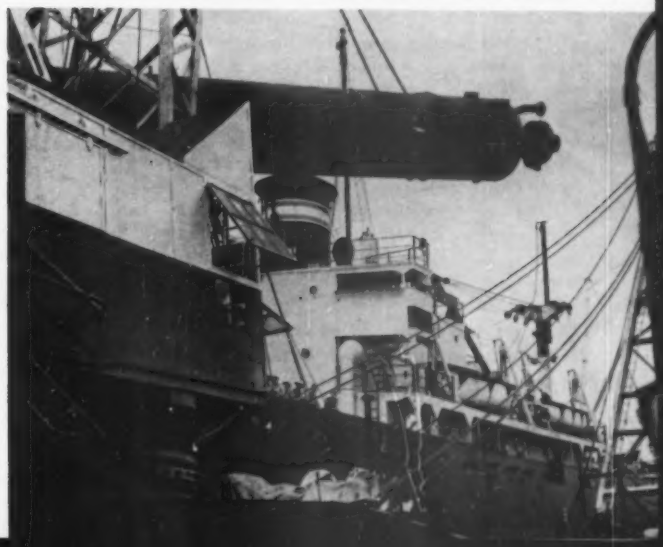
RASIOM's employment of these heretofore idle facilities will enable it to place a refinery in operation much sooner than would be possible through the purchase of all new facilities. It is a typical example of the use of American resources in the development of foreign industry, particularly the immediate industrial recovery of Europe.



Lowering 74,500-pound reaction chamber into hold of ship at Houston.

General view of refinery site at Longview after dismantling operations were well advanced.

Reaction chamber being raised over side of ship for lowering into hold.



IMPROVEMENT IN WORLD ECONOMY RESTS ON OIL

By J. E. Brantly

J. E. Brantly

THE known oil reserves of the world have been variously estimated at between 80 and 100 billion barrels. It is doubtless true that the actual reserves of usable oil are substantially greater than this figure, maybe as much as two or three times greater. Even though this is an enormous quantity of oil, the rate of consumption in the world today makes it insufficient to serve future requirements indefinitely, and, therefore, its conservation is essential. But we can only conserve by the use of proper production and manufacturing methods, for in order that the economy and culture of the world may be established on or built up to that plane which all peoples and all nations seek, the use of petroleum in liberal quantities by the peoples of the world is essential. For the accomplishment of this objective, oil must be made available to them.

The principal known oil reserves are confined to the several countries of Asia Minor, to the United States and to Venezuela. These three regions and countries contain probably 75 percent or somewhat more of the known reserves of the world, in the order in which the names are given. Canada, Argentina, Colombia, Mexico, Peru, Brazil and Chile are likewise producers of oil in the western hemisphere and contain proved reserves more or less in the order given. On the other side of the world, the East Indies, Burma, Pakistan and several of the countries of central Europe and the Balkan states likewise have appreciable quantities of proven oil in the ground. As for Russia, we cannot say, but with such a vast territory and numerous known producing areas, it undoubtedly has enormous oil reserves. All of the countries mentioned have undeveloped areas or regions of additional prospective reserves.

There are many other countries which today have no production or very little, but in which the possibilities of oil reserves exist. Still other nations have no oil-bearing formations within their bounds. It is the nations of these last two categories that must be supplied by those with production above their own requirements.

All areas or regions of the world in which sedimentary formations exist have possibilities in varying degree of producing oil. The four continents of North America, South America, Europe and Asia have vast areas over which sedimentary rocks are exposed, while there are many lesser basins of these formations. Throughout these regions of sedimentary rocks oil has either been found or there are possibilities that it will be found. By coincidence in the determination of boundary lines most of the countries of these four continents contain within their limits areas of possible oil production. On the continents of Africa and Australia the sedimentary areas are relatively small, though there are excellent possibilities of oil fields in eastern Africa and in parts of Australia. Thus, throughout the world a substantial majority of the nations or political units are either producing oil or have possibilities of producing it in varying degrees and probably in the majority of cases sufficient to supply their own requirements.

Oil is being produced by the world today at the rate of approximately 3.3 billion barrels annually. Of this quantity the United States produces roundly 60 percent or some two billion barrels. Following in order are Venezuela, Asia Minor, Mexico, Argentina, Canada, Colombia, East Indies and Peru. Other countries in which lesser quantities of oil are produced are Romania, Poland, Hungary, Italy and Albania. Other countries in which more or less substantial oil reserves have been found but in which commercial production has not as yet been undertaken are Turkey, Brazil and Chile. The principal exporting nations are, more or less in the order named, Venezuela, Asia Minor, Colombia, Peru and the Netherlands East Indies. Canada will likewise become an exporter after a sufficient number of fells have been drilled in its presently known great oil fields and when other facilities required for exportation have been established.

The world today is consuming oil at the rate of over three billion barrels annually. The potential production of the world is somewhat in excess of this, maybe as much as 20 percent more. Of this vast annual consumption the United States uses over 60 percent, which means that six percent of the population of the world is using nearly two-thirds of the total oil production of the world.

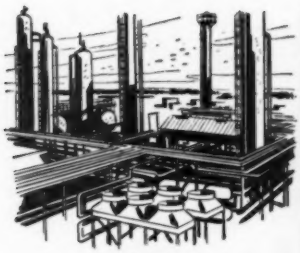
The consumption in the United States is approximately 800 gallons per man year, adding to the quantity of oil consumed the quantity of natural gas that replaces oil or for which oil would be used otherwise. The average consumption of the world per capita outside the United States is approximately 20 gallons per man year or one-fortieth of the quantity of petroleum and its products used in the United States. Including the consumption in the United States in the world average, then the per man year consumption is approximately 60 gallons.

On a square mile basis the United States uses approximately 30,000 gallons per year. Assuming the readily habitable part of the world at 35 million square miles, then the world, excluding the United States, consumes 1,300 gallons per square mile year, while the world including the United States consumes 3,000 gallons per square mile year.

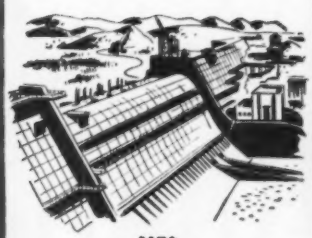
Argentina's areal consumption is approximately 2,000 gallons per square mile year or about one-fifteenth the average areal consumption in the United States.

The approximate figures on consumption that have been given are not for the purpose of citing

* President, Drilling and Exploration Co.



GASOLINE PLANTS

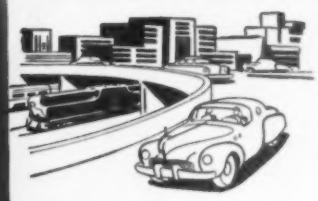


DAMS

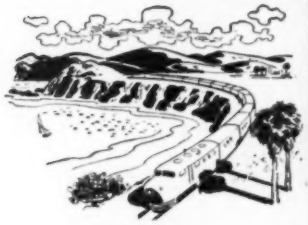
OFFSHORE PLATFORMS

BRIDGES

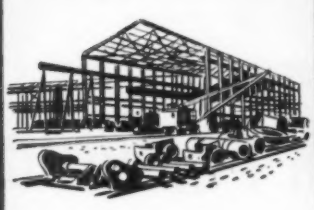
YOUR PROBLEM IS OUR PLEASURE



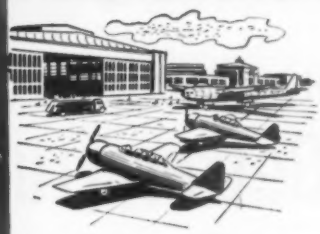
HIGHWAYS



RAILROADS



CHEMICAL PLANTS



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statistics but as indicating the amount of oil that is needed by a nation or the people of a nation in order that they may develop and enjoy the industry and economy that the use of petroleum in liberal quantities can afford them. Nor is it intended to use the United States as having the proper per capita consumption record in the use of oil. Possibly this country is wasteful of an essential commodity that occurs in relatively limited quantities in many parts of the world. There are many people who hold to this opinion. In justification, however, the United States has a low density of population and yet it employs for profitable use practically all of the land in the country that is usable. The nation has enormous natural resources which are being developed and it is intensively industrialized. In consequence great power development and transportation systems are necessary, and petroleum, along with coal and electricity, is one of the three major sources of power.

The standard of living of a country is governed by the amount of energy, which we rate in horsepower, available to and used by its people. The cheapest, most adaptable and generally useful prime mover is that which uses petroleum as its source of energy. Likewise the investment required in the prime mover for its horsepower capacity is lowest for power plants driven by petroleum or its products, though the basic energy or fuel may not be the cheapest. That is to say, a nation that needs more mechanical energy for its development can provide this energy for a smaller capital outlay by using petroleum products as the basic source of the energy. Likewise the power installations can be completed in a minimum length of time and, as already stated, for a lower capital outlay.

The primary point of the discussion may be carried further most easily by using a particular country as an example. For example we shall select Argentina.

Argentina is a country quite similar in many respects to the United States. It has great areas of very fertile soil, regions that are arid or semi-arid, mountainous areas and broad flat plains. Its climate resembles that of the United States, varying from semi-tropical to cold. It has a superior people of fine basic culture. Its primary points of basic difference with the United States are in its lack of mineral and timber resources and the source of its culture. The country has a population density that is roughly one-third that of the United States. Distances are broad; and in order that its people may utilize their lands to the fullest, for theirs must always be an agricultural economy, the type of power that petroleum can give them is most suitable for their purposes.

Argentina uses approximately 54 million barrels of oil annually, which is about 125 gallons per capita. This is less than one-sixth of the per capita use in the United States. It is doubtful that Argentina will ever need or could use to advantage as much petroleum per capita as the United States because it never can become as highly industrialized owing to the lack of the natural resources upon which industrialization depends, but it should use and does need probably 40 percent as much per capita as the North American republic. This would be a consumption of as much as 100 million barrels of oil annually for the country.

Today Argentina is producing 20 million barrels of oil annually and, therefore, requires for the economic and cultural development to which its people aspire an additional 80 million barrels. At an assumed cost of $5.00 per barrel under present prices, Argentina would need to spend or exchange $400 million worth of its products for its petroleum requirements. It is doubtful that Argentina now can or ever can afford to spend this proportion of its national income or resources on a single commodity that does not add to the capital value of the country except in that it increases the national income. Therefore, if Argentina is to have for its use all of the petroleum that it requires, a great part of it must be produced within its own boundaries. For the only nations which have and can have all of the petroleum that they require are those which produce oil within their own territories. Argentina has sufficient resources when developed to supply its requirements.

Brazil or France or China or Italy or Turkey or some other country might have been used as the example rather than Argentina. The same is true of all of them, for no nation can afford to buy all of the petroleum or its products that are required, if its ambitions in industrial and cultural developments are to be satisfied. This statement is definitely true of the United States as well as of the others. Its consumption is roughly six million barrels daily. Were the producing capacity of the nation two million barrels daily, then consumption would of necessity be much nearer that figure than that which is actually used. Americans could not afford to spend $20 million daily or $7 billion annually for the purchase of petroleum abroad.

There is a considerable overproduction of oil in the world today, and with the drilling of relatively few wells in Asia Minor and Venezuela, a much greater overproduction could be established. This, however, is relatively unimportant to the oilless nations of the world, for they cannot afford to purchase all their requirements abroad. Therefore, the search for oil in those countries which do not have production or which do not produce their requirements must continue and must be intensified. Further, a nation can better afford to produce oil within its own boundaries at an equivalent cost of $6.00 a barrel than it can to purchase oil abroad at $5.00 a barrel or even less. No capital or resources need be sent abroad in this case.

The oil industry of the world had its source or beginning in the United States. Therefore, the people most experienced with the capital, most experienced in the development of the oil industry from primary exploration to the use of the products are Americans, though the British and Dutch have likewise played a conspicuous part. Therefore, the countries of the world other than those which presently have adequate production and in which production was developed by American, British and Dutch capital and American technicians need this experienced capital and experienced personnel and machinery for the efficient and economic development of their resources.

Whether the development is carried on by the governments of the respective nations or with the aid of foreign capital remains to be decided by the governments concerned and whatever their decision, whether economically sound or not, it is quite within their prerogatives and should receive the respect and support of other peoples.

Those few nations that do not and cannot produce their own oil deserve to have petroleum products made available for their use at prices they can afford to pay. That is, they deserve to share on a reasonable basis in this essential natural resource that the eccentricities of nature and the selection of national boundaries have denied them in order that their development may progress on a par with other nations of the world. All need the prime movers in which the petroleum is to be used and the machines to be operated by them, and these too must be made available to the nations that do not manufacture them, likewise on a reasonable basis.

Distillate Well in Italy

Pictured below is the discovery well in the upper Po Valley of northern Italy, brought in during June by Azienda Generale Italiana Petroli (AGIP), government controlled company. Location is at Cortemaggiore, about 55 miles south of Milan. The well created a stir in Italy when it produced about 200 barrels daily on test of very light oil in conjunction with large quantities of gas. Tests were made through perforations at about 5,000 feet.

Gas in commercial quantities previously had been discovered in the vicinity of the new well, and results of the drilling are encouraging enough to warrant a third well on the structure.

ECA OIL OPERATIONS AID EUROPEAN RECOVERY

By Joseph Huttlinger

IN the course of its past history the oil industry has experienced many sudden swings of the pendulum from actual or threatened scarcity of supplies to temporary periods in which production outran demand. Over the past decade, however, throughout World War II and the postwar years up to the end of 1948, the great task of the industry has been to produce, process and distribute oil in quantities sufficient to meet rapidly mounting requirements. Now, as a result not so much of fresh discoveries as of broadening of facilities for transportation and treatment, fear is again being voiced of impending oversupply and of potentially destructive competition between newer and older fields. As an outgrowth of such apprehensions, there has been criticism of the European Recovery Program and its implementation through the Economic Cooperation Administration on the ground that American funds were being used in building up competition likely to become dangerous to American interests.

When the Marshall Plan was being drawn up two years ago, a survey of the sixteen European countries to which it was to extend indicated that the most urgent and effective means of aiding their industrial recovery was the supply of petroleum products and of equipment for the development of oil production and refining. It was calculated that approximately 20 percent of the whole amount appropriated for the European program would be needed for oil and oil industry equipment. It was estimated by the Organization for European Economic Cooperation that requirements of crude and refined for the year now beginning would amount to some 380 million barrels (54.1 million metric tons) of an estimated value of $1,373 million and of equipment to a value of $592 million, of which $211 million would come from dollar sources. At that time a great many citizens of the United States were worried by the possibility that the country's oil output might be inadequate for domestic needs, and the federal administration was urging the investment of many millions to establish a string of government owned plants for the manufacture of synthetic products. In order to guard the domestic supply, Congress stipulated that so far as possible ECA purchase oil for European use from sources outside the United States. Following these instructions procurement authorizations by ECA for the first period of its operations, from April to Dec. 31, 1948, amounted to $354.8 million divided about equally between the United States, South America and the Middle East. A large proportion of the purchases from the United States consisted of high-grade products such as motor fuel and lubricants so that, on the basis of tonnage, its share of the business was less than that of the other areas which supplied mainly fuel oil and crude. During 1948 less than 10 percent of the imports to countries participating in ERP were drawn from the United States, compared to about 30 percent prewar.

Consumption of petroleum products by the European countries participating in ERP was roundly 30 million metric tons (583,000 barrels daily) prior to the late war. This had risen to 38.4 million tons (768,000 barrels daily) in 1947, and it is estimated by OEEC at 49.7 million (993,000 barrels daily) in 1950 and at 62.4 millions (1,248,000 barrels daily) in 1953. The estimate of ECA is slightly more conservative, being placed at 58 to 60 million tons (1,160,000 to 1,200,000 barrels daily) in 1953.

Production within the national boundaries of the sixteen countries is small and is not expected to increase greatly, but production overseas by companies located in these countries is capable of a very great increase. The estimate of OEEC is that the two combined will reach 90.9 million tons (1,800,000 barrels daily) in 1950 and 115.7 million tons (2,300,000 barrels daily) in 1953. Not all of this, of course, would seek a market in Europe. Receipts of all products by the European area in 1953 are estimated at 62 million tons (1,200,000 barrels daily), of which the Middle East is expected to provide slightly more than three-quarters, while Latin America is expected to supply 22 percent and the United States only a little over three percent. The assumption is that by the end of the recovery program exports to Europe from the United States will be confined largely to specialties and that the main supply of that area will be coming from the Middle East.

Increased refining capacity for Europe was an integral part of the recovery program. Since existing facilities were inadequate to provide the quantity of products required, some increase was necessary inasmuch as the administrators of the program were instructed to obtain supplies so far as possible from sources outside the United States. A more compelling reason was the saving effected in foreign exchange by importing crude rather than products, estimated at 20 percent or more of the cost of the latter.

The possibility of establishing a refining industry sufficient to meet their individual needs, and even in some instances to provide a surplus of products for export, appealed to the European governments, and the plans reported to OEEC, even after some trimming, represented a projected growth in refining capacity well beyond the estimated increase in consumption, as indicated by the accompanying Table I which lists projected refining growth up to 1953 within the participating countries and in overseas areas operated by companies located within those countries.

Table II

Projected Refining Capacity in Participating Countries[1]

National Submissions in Thousands of Metric Tons

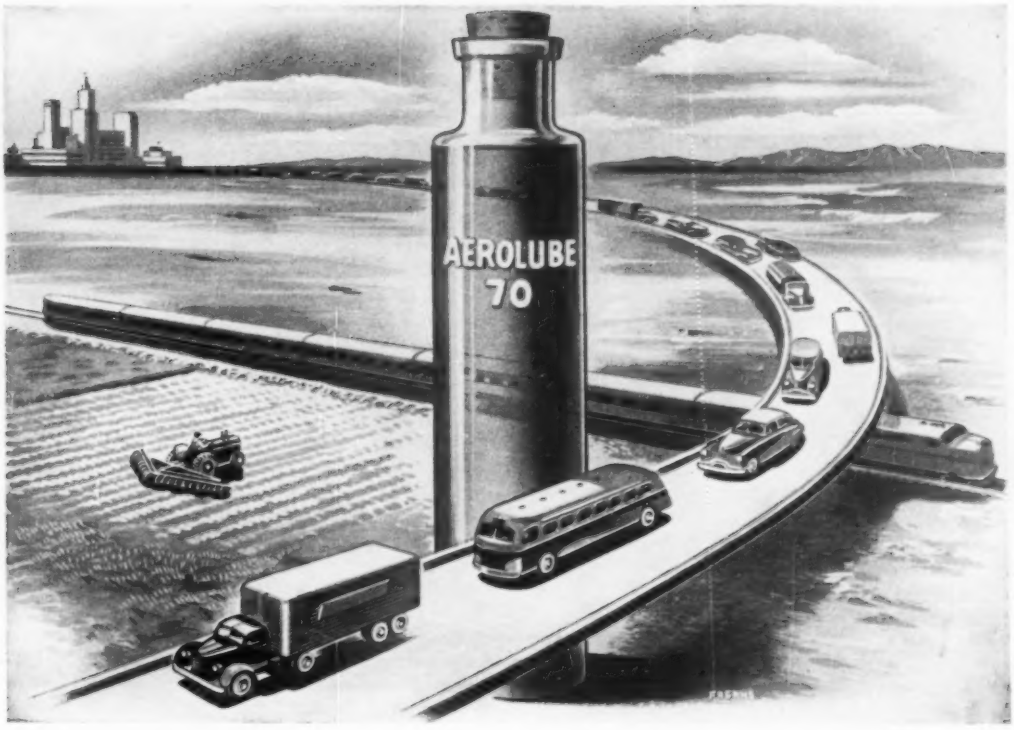
	Fiscal 1953 [2]	Fiscal 1950	Fiscal 1949	1947 [3]	1938
Austria	1,275	[4]1,200	[4]1,200	[4]1,200	625
Benelux	8,360	3,915	2,960	1,700	1,500
Denmark	877	27	27	27	20
France	18,700	12,715	11,200	7,500	8,000
Germany—Bizone	4,100	3,380	2,200	750	2,800
Germany—French zone	40	40	40	40	n.a.
Greece	400	0	0	0	0
Italy and Trieste	9,885	5,290	3,410	3,000	1,500
Norway	35	0	0	0	50
Portugal	500	400	300	300	0
Sweden	1,600	1,150	550	550	60
Switzerland	90	90	90	0	0
United Kingdom[5]	19,800	7,000	5,500	5,300	4,700
Total	65,662	35,207	27,477	20,367	19,255

[1] Estimates are for refining capacity or, for some countries, crude oil throughput rates, at the midpoint of each fiscal or calendar year (except for calendar 1947, as noted). Capacity of refineries owned by subsidiaries of American companies is included.
[2] Preliminary estimates as submitted to OEEC.
[3] Capacity as estimated for end of calendar year 1947.
[4] All refineries are located in the Russian zone of occupation.
[5] The United Kingdom estimates refinery throughput for fiscal 1955 at 23.8 million tons.

Table I

Estimated Growth in Refining Capacity
(In millions of metric tons)

	Europe	Overseas	Total
1947	20.4	49.7	70.1
Fiscal 1949	27.5	54.2	81.7
Fiscal 1950	35.2	57.0	92.2
Fiscal 1953	65.7	72.0	137.7



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For further information in Europe, consult Cyanamid Products, Ltd., Bruttenham House, Lancaster Place, London W. C. 2, England.

Table III

Estimated Value of Equipment Required
(In thousands of dollars)

Type of equipment	Fiscal 1950 Dollar sources	Fiscal 1950 Nondollar sources	Fiscal 1950 Total	Fiscal 1949 Dollar sources	Fiscal 1949 Nondollar sources	Fiscal 1949 Total
Drilling	53,744	51,694	105,438	38,906	30,955	69,861
Well casing	13,800	17,122	30,922	17,400	16,800	34,200
Refining	124,127	189,129	313,256	84,877	116,414	201,291
Transportation and distribution	[1]	[1]	[1]	10,957	71,923	82,880
Storage	15,260	81,003	96,263	9,104	62,287	71,391
Pipe lines	2,645	40,850	43,495	25	19,800	19,825
Miscellaneous	[1]	[1]	[1]	31,271	62,429	93,700
Undistributed	2,000	1,000	[2] 3,000	0	0	0
Total	211,576	380,798	592,374	192,540	380,608	573,148

[1] Not included in national submissions.

[2] These figures represent the program for French overseas territories for which no distribution by type of equipment is available.

NOTE:—For the purpose of this table, estimates have been used as prepared by the participating countries; they include equipment required by American companies operating in the participating countries and operating in joint ventures with British companies overseas.

According to present plans included in the national submissions, total capacity will increase to 153 million tons by fiscal 1955. Data for some countries represent estimated throughput and for some countries estimated capacity.

Against the background of estimated refining capacity of 137.7 million tons (2,754,000 barrels daily) in 1953, it may be interesting to set the estimated 1953 production of 115.7 million tons (2,314,000 barrels daily).

The prospect thus presented is for a refining capacity in western Europe of 65.7 million metric tons as against an estimated demand of 62.4 million tons. In addition production by overseas refineries controlled by European companies is placed at 72 million tons. A substantial part of the output of these refineries normally would seek the European market, leaving that continent with available exports of 10 million tons or more.

ECA administrators were quick to criticize these figures as "not representing a well-balanced economy," pointing out that they provided for an annual increase of 14 percent in capacity as compared with an anticipated yearly growth in consumption of six percent. Attention was called to the fact that there would be important additions to refining facilities in other parts of the world including the western hemisphere and that so great an increase in European refining is not in line with future marketing possibilities.

ECA's position is that, while it is economically advantageous and a contribution to industrial recovery for countries included within the Marshall Plan to establish refineries to supply their individual requirements, there is no justification for creating a surplus for which no market would be readily available. To quote from its own report, "The refining equipment program in and outside Europe must be coordinated with and carefully adjusted to the overall world oil economy. The considerations that must enter into such an evaluation include the anticipated level of consumption in Europe, the availability of crude oil and refined products from all non-European sources and the market outlets available to companies of participating countries outside Europe. The proper location of refineries must be studied carefully, and there must be market outlets for their output at competitive prices. If, as a result of the refining expansion program, new trade barriers were to be erected because Europe could refine oil only by raising import duties on refined products, the cost of oil to Europe would be increased."

While ECA is exerting its influence to prevent refinery overexpansion, it does not control the situation. Some of the largest refineries under construction or projected in Europe are being built by international companies with their own funds and without dependence on governmental assistance. Estimated capacities by countries, based on national submissions, are shown in Table II.

The third major part of the ECA oil program is the provision of equipment to get out the oil and build the refineries, storage and pipe lines to handle it. Table III, based on submissions from the European countries, presents the program for the 1949-50 fiscal years.

While some $211 million worth of equipment is to come from dollar sources, much of this is for American companies operating abroad, which will pay for it out of their own earnings. The ECA bill for equipment is estimated at about half this sum.

Some two-thirds of the equipment is destined for the United Kingdom and about one-fifth for Italy and France. Much of it will go to overseas uses. Of the dollar-sources equipment, about 51 percent will be used in the participating countries, 14 percent in their overseas territory and 35 percent in other countries where the sixteen nations are operating, such as the Middle East.

The figures show that equipment for the refining program accounts for more than half the total

Table IV

Petroleum Equipment Program, Fiscal Year 1950

(In thousands of dollars)

	Drilling equipment Dollars	Drilling equipment Nondollars	Well casing Dollars	Well casing Nondollars	Refining equipment Dollars	Refining equipment Nondollars	Storage equipment Dollars	Storage equipment Nondollars	Pipe line Dollars	Pipe line Nondollars	Grand total Dollars	Grand total Nondollars	Grand total Total
Belgium—Luxemburg	0	0	0	0	4,000	1,000	818	207	0	0	4,818	1,207	6,025
Denmark	0	0	0	0	900	0	0	0	0	0	900	0	900
France[1]	1,380	13,700	0	2,000	2,743	51,460	55	22,300	45	2,000	6,223	92,460	98,683
Germany—Bizone	2,821	7,400	0	7,600	5,555	10,000	0	25,000	0	0	8,376	50,000	58,376
Greece	0	0	0	0	4,570	0	720	0	0	0	5,290	0	5,290
Iceland	0	0	0	0	0	0	0	400	0	50	0	450	450
Ireland	0	0	0	0	0	0	122	287	0	0	122	287	409
Italy and Trieste	5,625	0	0	0	26,828	3,960	705	0	200	0	33,358	3,960	37,318
Netherlands	0	0	0	0	2,022	290	0	938	0	0	2,022	1,228	3,250
Norway	0	0	0	0	400	600	0	0	0	0	400	600	1,000
Portugal[1]	5,118	794	0	322	1,609	619	3,440	871	0	0	10,167	2,606	12,773
Sweden	0	0	0	0	2,500	0	0	0	0	0	2,500	0	2,500
Turkey	5,000	0	0	0	0	0	0	0	0	0	5,000	0	5,000
United Kingdom[1]	33,800	29,800	13,800	7,200	73,000	121,200	9,400	31,000	2,400	38,800	132,400	228,000	360,400
Total	53,744	51,694	13,800	17,122	124,127	189,129	15,260	81,003	2,645	40,850	211,576	380,798	[2]592,374

[1] Data for France, Portugal, and United Kingdom include overseas programs. Totals for France include 2 million dollars from dollar sources and 1 million dollars from non-dollar sources for overseas territories, for which distribution by type of equipment is not available.

[2] Totals include undistributed items.

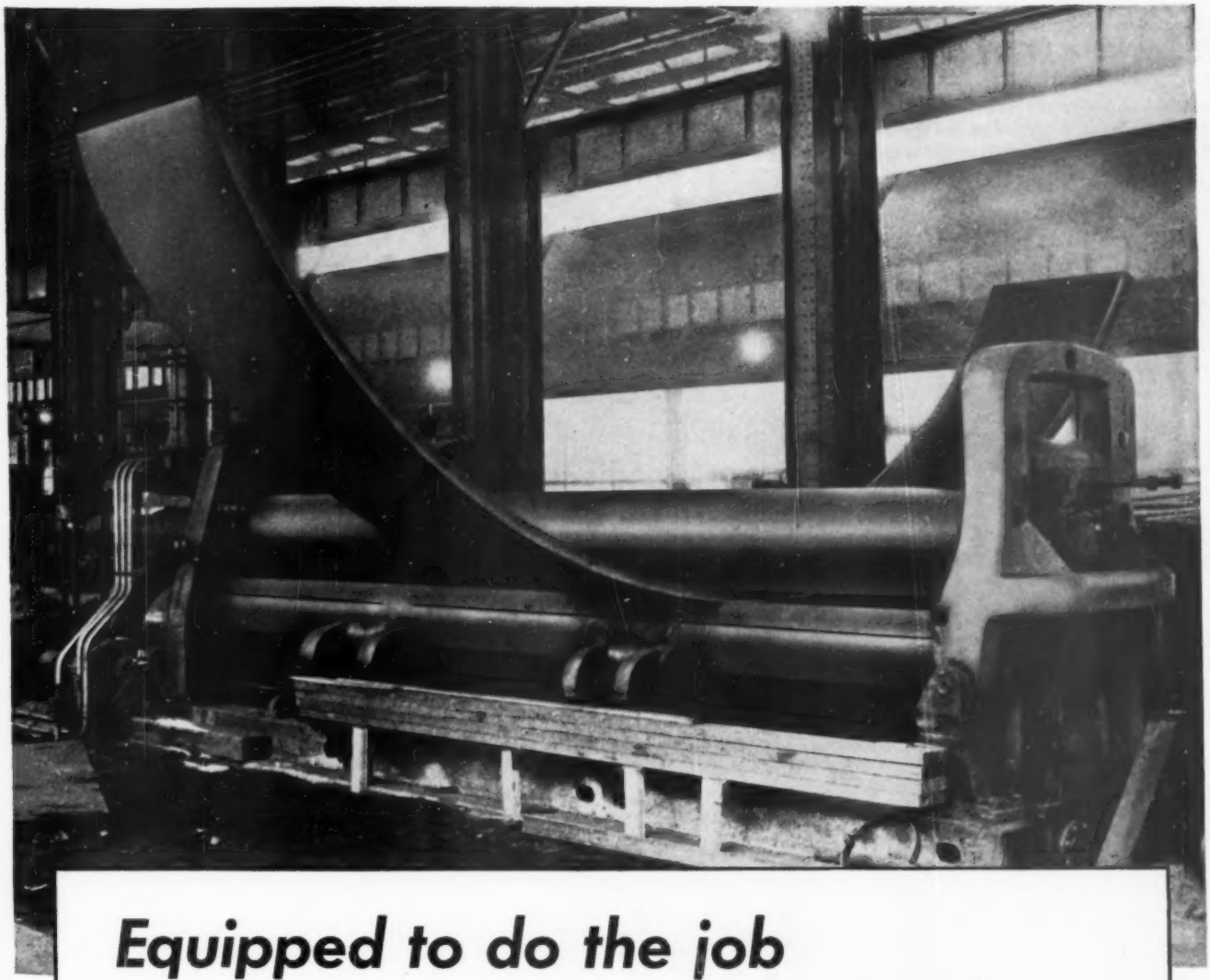
NOTE:. Equipment included under the heading "dollars" must be obtained almost entirely from the United States whereas equipment shown under the heading "non-dollars" is in general produced in the participating countries.

The country totals for fiscal 1950 apparently exclude certain items such as transportation and distribution equipment.

For the purpose of this table, estimates have been used as prepared by the participating countries; they include equipment required by American companies operating in the participating countries and operating in joint ventures with British companies overseas.

The United Kingdom estimates, totaling 360.4 million dollars, exclude certain local expenditures such as the cost of construction, labor and tools, land acquisition, insurance, supplies, which, however, are included in the figure of 500 million for total British investment in petroleum development, as cited on p. 79 of the United Kingdom Country Study, published in February 1949, by ECA.

The United Kingdom estimates include the overseas programs outside North America of British companies (including the Royal Dutch Shell Cos.) and the French share of the Iraq Petroleum Co.'s program.



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value, production equipment for 22 percent and pipelines and storage for the remainder.

In Table IV is shown by countries and by classifications the equipment required for the fiscal year now in progress, according to the estimates of representatives of the participating countries:

Most encouraging to ECA is the growth in European consumption as an indication of the progress being made toward the goal of recovery. Estimates point to a doubling of consumption by 1953 as compared with prewar, and the expectation is that these estimates will be realized. No longer is ECA Administrator Paul Hoffman concerned as he once was with the availability of crude oil to satisfy the growth of demand. The higher consumption goes now, the better for the world oil industry.

According to ECA's reports industrial use in Europe of products is now about three times as high as in the prewar period, agricultural use four times as high; diesel use has multiplied many times, and all transportation use is higher except pleasure driving, which is lower than prewar, due to strict gasoline rationing in most of the countries.

Table V shows current progress of consumption by European countries and estimated increase to 1953 as prepared by OEEC.

A review of ECA's first 15 months up to July reveals the expenditure of $570 million for crude and products for Europe. Of this some $204 million worth came from the United States, $160 million from Latin America and $173 million from other areas, chiefly the Middle East.

As would be expected, the United Kingdom was the chief recipient of crude and products, as of most aid under the ECA program. It received $181 million in ECA-financed crude oil and products. Then came France, $170; Italy, $46; Netherlands, $33; Sweden, $33; Denmark, $34; Belgium-Luxembourg, $30; Austria, $26; Greece, $15; Norway, $13; French Zone of Germany, $8; Ireland, $7; Bizone Germany, $6; and Trieste, $2.6.

In equipment authorization the period was devoted chiefly to planning. Less than $8 million in equipment programs was approved by ECA in the first year, of which the major single project was a lubricating oil plant near Trieste, for which ECA agreed to put up slightly more than half the funds.

The program for the current year, as regards crude and products shipments to Europe calls for the expenditure of $550 million in ECA funds to buy about 220,000 barrels a day. When payments for tanker transportation and petroleum equipment are added, the total will be somewhere between $800 and $900 million, or more than 20 percent of the ECA outlay in this year.

In an address to the National Petroleum Council just before resigning his position as head of the petroleum division of ECA, Walter Levy said that ECA will continue to stand for free world trade in oil and against bilateral agreements which may close markets to American participation. He defined ECA policy as including the following:

"Expansion of European oil facilities is justified only to the extent that the output from such facilities can be sold without the use of discriminatory trade or currency practices.

"ECA does not believe that Europe should save dollars or earn foreign exchange by driving American oil from the European market or from other foreign markets by exclusive bilateral barter arrangements or similar devices.

"The only European expansion that can justifiably be accepted by the United States government as part of the recovery program is an expansion in line with truly competitive outlets in the market places of the world."

Table V

Consumption of Petroleum Products by Participating Countries
(In thousands of metric tons)

	Fiscal 1953 [1]	Fiscal 1950 [1]	Fiscal 1949	Year 1947	Prewar [2]
Austria	532	464	438	350	389
Belgium—Luxemburg	[3] 5,010	1,972	1,910	1,300	875
Denmark	2,018	1,529	1,422	1,271	894
France	13,580	10,239	8,278	5,968	5,849
Germany—Bizone	3,314	2,162	1,880	1,226	[4] 3,131
Germany—French zone	325	273	212	152	[5]
Greece	1,043	858	841	541	385
Iceland	250	170	171	100	20
Ireland	640	566	540	441	302
Italy and Trieste	5,316	4,031	3,951	3,041	2,765
Netherlands	[3]	2,634	2,603	2,207	1,610
Norway	1,826	1,602	1,465	1,008	585
Portugal	594	726	646	715	[4] 275
Sweden	3,900	2,680	3,146	3,228	1,359
Switzerland	1,027	888	938	884	467
Turkey	1,000	740	543	355	220
United Kingdom [6]	21,989	18,198	18,040	15,616	10,940
Total Europe	62,364	49,732	47,024	38,403	30,066

[1] Preliminary country estimates as submitted to OEEC.
[2] 1938 or other representative prewar year.
[3] Netherlands combined with Belgium.
[4] OEEC estimate probably includes French zone.
[5] Estimated by ECA.
[6] All consumption figures include an undetermined quantity of tar, benzol, and other synthetic petroleum products.
NOTE: Excluding all bunkers from bonded stocks except those supplied to national flag vessels in their own countries.

Trans-Arabian Pipe Line

(Continued from page 55)

which had charge of the licensing of exports. In 1948 after shipments of pipe sufficient for about 20 percent of the line had been approved at quarterly intervals, OIT refused to issue the permit needed at that time in order to insure scheduled progress of construction. No official explanation of the action was given, but it was generally assumed to be in response to protests from groups who objected to the export of steel at a time when domestic users were having difficulty in obtaining supplies of the metal. No indication was given as to when shipments could be resumed, and in fact it was not until late in the year when the steel stringency in the United States had lessened that the next permit was issued. Meanwhile the builders of the line adopted the only feasible procedure by restricting operations to its extreme eastern section, using pipe from the stock in hand to keep their forces occupied. The effect of the hold-up was to delay final completion of the line, which originally was scheduled for the beginning of 1950 but is now expected to take place a year later.

The immediate effect of Tapline's completion will be to place 300,000 barrels of MidEast oil daily on the eastern shore of the Mediterranean, 7,000 miles nearer to the markets of western Europe than when it had to take the long water route around the Arabian peninsula and through the Suez Canal. It will also reduce the cost of the tanker movement by at least 18 cents per barrel, that being the toll charged by the Suez Company. The capacity of the line could be raised to 500,000 barrels daily by the addition of five more pump stations. As is well known, the construction of the Trans-Arabian system is to be followed by two or possibly three large-capacity lines moving oil from other fields in the Persian Gulf area to points on the eastern Mediterranean. By 1953, without assuming any increase in Tapline's initial capacity by that date, it appears that 1,250,000 barrels or more will be reaching the Mediterranean littoral daily. From this vantage point Mid-East oil will be in a strong position to dominate the markets of the Mediterranean area and western Europe. This is a development that has been anticipated in the international oil trade since the beginning of large-scale production in the Persian Gulf region.

New Books

Constructive Uses of Atomic Energy, by leaders in atomic research, edited by S. C. Rothman; published by Harper and Brothers, New York; 258 pages; $3.

Fourteen experts give the layman a look at the peaceful uses of atomic energy in industrial power, chemistry, metallurgy, aviation, ceramics, fertilizer research, biological research and medicine. It all makes interesting reading. According to Prof. Arthur H. Compton, the day when atomic energy will compete with coal and oil is still remote, but the other phases of this new power are rich in benefits to humanity.

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International News and Notes

Leonard Sinclair

LEONARD SINCLAIR, recently appointed an additional managing director of Anglo-American Oil Co., Ltd., joined the company when he was only thirteen years of age, as a junior clerk in Manchester, the city of his birth. By 1922 he was a circuit manager and five years later an assistant manager at Birmingham. Between 1929 and 1933 Mr. Sinclair was successively marketing specialist and manager of various branch offices. In 1936 he joined the International Association (Petroleum Industry) Ltd., and in 1943 was elected to the board.

Mr. Sinclair's career with Anglo was interrupted by military service during the first world war. During the recent war he was a director of the Petroleum Board, set up to administer Britain's petroleum supplies.

German Wildcat Finds Production

Following the opening in May of this year of the Ruehlertwist oil field in the Emsland district, a second important find has been made in the Land Niedersachsen near the old Hanoverian fields. The wildcat well Suderbruch 1 on a concession jointly owned by Gewerkschaft Brigitta (Shell & Standard Jersey affiliate) and Deutsche Vacuum Oel AG. (Socony-Vacuum Oil Co.) has found oil at a depth of 6,759 feet in a 46-foot oil sand of the Cornbrash formation (Middle Jurassic). The total depth of the well is 7,073 feet. In a production test on August 11 the well flowed 240 barrels through a 4-mm (0.16-inch) valve. Compared with other Hanoverian crudes, the gravity of 0.847 is very light, the gas-oil ratio being 1 : 5 to 1 : 20. Suderbruch is at present the deepest producing oil well in northwestern Germany. The well apparently is not directly connected with saltdome structures in the neighborhood but represents an intermediate structure. The location is east of the Steimbke oil field in the Weser-Aller region of Land Niedersachsen.

To Enlarge Italian Operations

Shareholders of STANIC, a new Italian oil refining company jointly owned and operated by Standard Oil Co. (N. J.) and the Italian-owned company of ANIC, have determined at their first meeting to increase the company's capital and to modernize its refineries at Leghorn and Bari, Italy. The shareholders' meeting in Milan voted to increase the initial capital of STANIC from 20 million lira ($35,000) to 12 billion lira ($21,000,000).

Immediately preceding the shareholders' meeting the board of directors of STANIC held their first session under the presidency of Dr. Ernesto Santoro. Nominated as managing directors were Victor J. Decorte by the American group and Dr. Santoro by the Italian group.

During the war the Bari plant was forced to close but experienced little damage. The Leghorn refinery was badly damaged by Allied bombs and later looted by the retreating Germans. After the first Allied landing in Italy, port facilities at Bari played an important part in the receipt and storage of oil supplies for the Allied armies. At present the Leghorn plant has been partially restored and the combined capacity of the two plants is approximately 16,000 barrels daily, utilizing crude oil from convenient Middle East sources. The output of both refineries will be marketed by SIAP, the Italian affiliate of Standard.

Refinery for Puerto Rico

A 25,000-barrel-per-day petroleum refinery is projected for construction, at an estimated cost of $20,000,000, near Ponce, Puerto Rico, according to an announcement by Lyford and Eberle, consultants of New York. The refinery is to be built and operated by the Puerto Rican Oil Refining Co. with headquarters at Ponce. Puerto Ricans are participating in the organizational work and will have a substantial interest in the enterprise. It is anticipated that the refinery will be in operation early in 1951.

The firm of Lyford and Eberle is composed of Frederic E. Lyford, former president of Merritt, Chapman and Scott, and W. C. Eberle, who was wartime transportation director of District One, Petroleum Administration for War. Parsons, Brinckerhoff, Hall and Macdonald, of New York, is handling the engineering. Roy M. Henwood is process engineer.

British Technicians Visit U. S.

In pursuance of the technical assistance program of the Economic Cooperation Administration, a 14-man group from Great Britain will arrive in the United States in October for a six-weeks' visit to study American methods and techniques in the manufacture of internal combustion engines. The party, which includes supervisors, technicians and workers, is particularly interested in procedures applying to the production of light and heavy diesels, gasoline-cooled and liquid-cooled engines. This will be the seventh team of British industrial representatives to visit the United States under the auspices of ECA.

WILLIAM A. MATTHEWS has been named division geophysical supervisor in Stanolind Oil and Gas Company's foreign exploration department, Canadian division. His headquarters will be at Calgary, Alberta. Mr. Matthews has been division geophysical supervisor in the Rocky Mountain division. C. F. Schock is exploration superintendent for Stanolind's Canadian division.

Elected To Insurance Board

William K. Whiteford, president of The British American Oil Co. Ltd., Toronto, Canada, and of The British American Oil Producing Co. with headquarters in Tulsa, Oklahoma, recently was elected a director of the Canada Life Assurance Co., Toronto, one of Canada's oldest and second largest life insurance company, incorporated in 1849. The insurance company's operations extend not only throughout Canada but in many states of the United States as well as Great Britain, North Ireland, Europe, the Bahamas and Bermuda.

R. A. Carder

R. A. CARDER, who has just been appointed chairman of Anglo-American Oil Company in succession to David A. Shepard, has served with the company for 29 years. Born in Worcestershire in 1892, Mr. Carder was educated at King Edward Grammar School, Birmingham, one of the oldest schools in England. During the first world war he served in the Royal Navy as a lieutenant and was later assigned to the Petroleum Executive, headed at the time by the late Lord Cadman.

In March 1920 Mr. Carder joined Anglo-American Oil Company as secretarial assistant. Five years later he was appointed deputy secretary, and in 1930 he was made secretary. He was elected to board of directors in 1933 and in 1939 became managing director. He was also a director of the Petroleum Board, set up to administer Britain's petroleum supplies during the late war.

German Coal-Tar Industry

German production of coal-tar by low-temperature methods, which helped to augment fast-dwindling German reserves of liquid fuels during World War II, is described in a comprehensive report published by the Bureau of Mines as Information Circular 7490. Copies are available at Pittsburgh, Pa., offices, 4800 Forbes Street, Pittsburgh 13. One of a series of Bureau reports on wartime German developments in the mining, preparation and utilization of coal, the publication was prepared by E. O. Rhodes, manager of the development section of the tar products division, Koppers Co. Inc., and member of a solid fuels mission to Germany.

Test Drilling In Australia

Following a report by Eric K. Craig, American geologist, Ampol Petroleum Ltd., largest Australian distributor of petroleum products, will drill a wildcat in Western Australia where it has an exploratory permit covering an area of 200,000 square miles. First test will be made near Exmouth Gulf about 600 miles north of Perth, the state capital. Surface and subsurface formations in the Rough Range near the Gulf closely resemble those of oil fields in California and are held to justify examination by the drill. Depending upon the results of this first exploration, other wells may be put down in the Cape Range district along the North West Cape peninsula on the western side of the Gulf.

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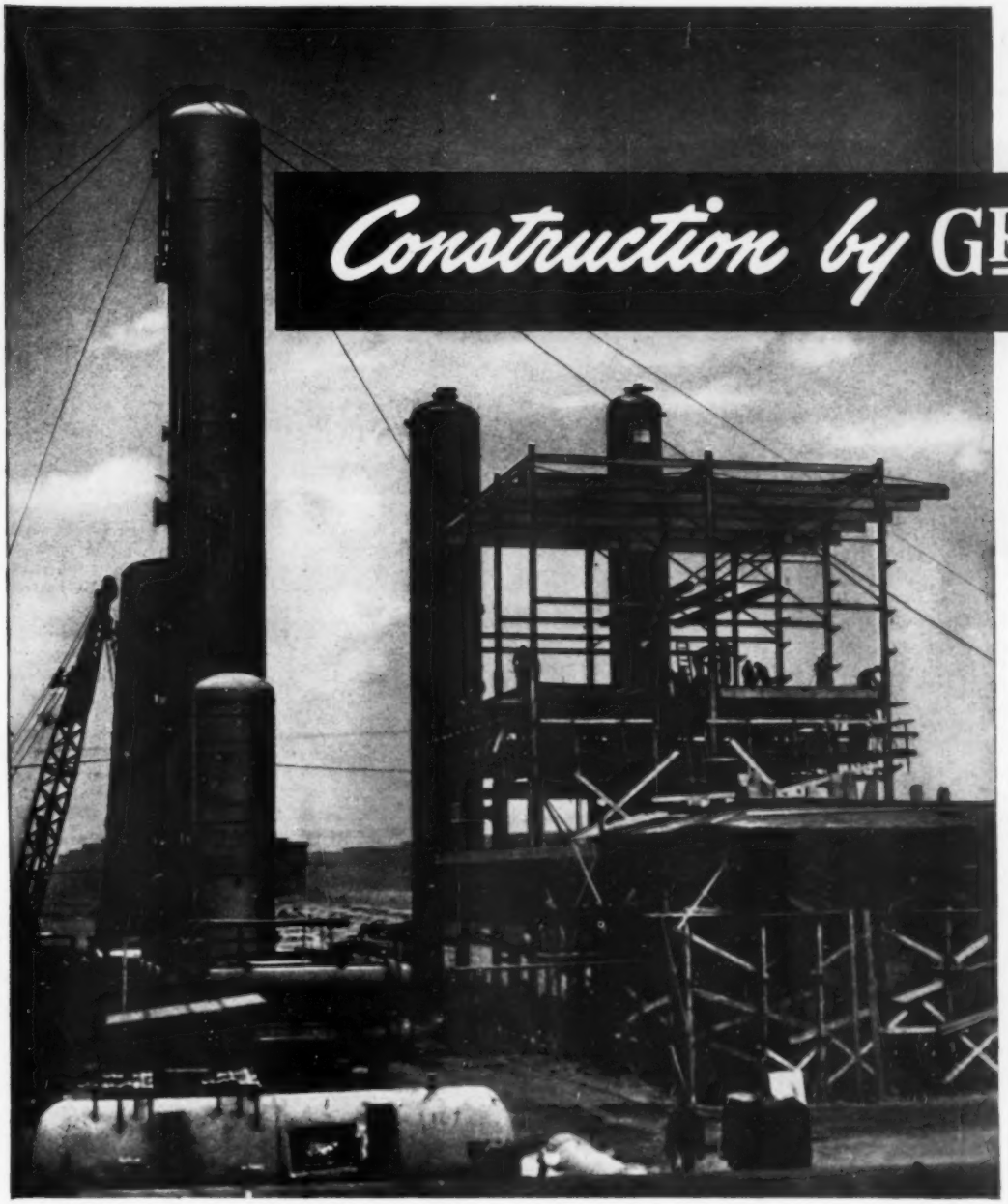

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OIL COMPANY STAFF CHANGES

Horry F. Prioleau

HORRY F. PRIOLEAU will rejoin Standard-Vacuum Oil Co. shortly as a director and vice president. Now senior vice president and a director of Creole Petroleum Corp., Mr. Prioleau had been general manager of a Standard-Vacuum subsidiary in The Hague prior to the war. Associated with the petroleum industry in the United States and abroad since 1921, Mr. Prioleau went to The Hague in 1929 and became general manager there for Standard-Vacuum Petroleum Maatschappij in 1934. Forced out by the German occupation of Holland in 1940, he returned to the domestic oil industry and joined Creole in 1943 as assistant to the president. Mr. Prioleau was elected a vice president and director of that company in 1944.

JOHN E. LINDROTH, assistant secretary of Standard Oil Co. (N. J.), has been appointed budget director. C. L. Burrill, who has been head of the budget department, is resigning to join Creole Petroleum Corp., a Jersey Standard affiliate. Mr. Lindroth, who also served as chairman of the company's executive committee, will be succeeded by John O. Larson, assistant secretary of both the company and the executive committee.

LLOYD F. THANHOUSER of New York City will become general counsel of Continental Oil Co. effective Oct. 1. Burney Braly, formerly general attorney for Continental, with offices at Fort Worth, has been appointed associate general counsel. Mr. Thanhouser will succeed James J. Cosgrove who has been general counsel since 1929 and who will devote his time to his duties as chairman.

GEORGE S. DUNHAM has been appointed vice chairman of the manufacturing committee of the Socony-Vacuum Oil Co. Inc. He will supervise operations of the company's eastern and midwest refineries and pipelines. He succeeds Douglas L. Hooker who has retired from active service with the company.

HENRY W. DODGE, formerly general sales manager of The Texas Co., has joined Mack Trucks Inc. as executive vice president with special responsibility for sales and advertising. Mr. Dodge, chairman of the board and director of Air Products Inc. at the time of his acceptance of the new position, was on loan to ECA as chief of petroleum on the staff of Ambassador W. Averell Harriman in Paris. He resigned both positions as of June 30.

G. C. Gester

G. C. GESTER, one of the industry's foremost authorities on world and domestic oil reserves, has retired after 32 years with the Standard Oil Co. of California. He first went abroad, to Peru and Ecuador, as head of an exploration part for the Standard Oil Company of New York in 1914. During World War I he was engaged in independent work which included a war mineral survey, mine examinations and investigation work for Standard of California. In 1917 he went to work in Standard's geology department, and a year later became the company's chief development geologist. He was made chief geologist in December 1920.

In the 22 years in which Mr. Gester served in this capacity, he made many trips to far corners of the earth as his company's search for oil expanded and also spent some time at Standard's offices in London and The Hague.

R. W. GEMMER has been named chief geophysicist for The Carter Oil Co. to succeed Dr. A. B. Bryan who has been transferred to Standard Oil Development Co. Before joining Carter in 1935, Mr. Gemmer was on the geophysical staff of the Humble Oil and Refining Co., Houston, for nine years, during which time he was instrumental in development of the Blau-Gemmer method of electrical logging. He has been assistant chief geophysicist for Carter since 1947.

R. W. Gemmer

FREDERICK C. LOOMIS has been appointed oil purchase and exchange agent for Standard Oil Co. of Calif. In the newly-created position he will centralize activities previously carried on by a number of departments. He will be in charge of all the company's oil purchase and exchange negotiations and agreements. His assistant will be Frank L. Frick. Mr. Loomis joined Standard in 1924. In 1945 he was made assistant manager of the natural gasoline department, which position he held till his present appointment. Mr. Frick has been with Standard since 1921 and has been associated with the company's crude oil purchasing operations since 1931.

J. R. VANDEVER has been named general superintendent of the production department of Sunray Oil Corp. He has been assistant general superintendent since 1948. Prior to assuming his supervisory duties at Tulsa, he was division superintendent of the north and west Texas division.

JOHN E. NELSON, executive vice president of Gulf Oil Corp., retired Sept. 1. Mr. Nelson was a director of Gulf and a member of the executive committee and many other committees. Mr. Nelson's decision to withdraw from active business life comes after more than 47 years of association with the Mellon interests, 42 years having been spent in various official capacities with the Gulf companies.

C. J. ALLEN of Sinclair Refining Co. has been elected a vice president and I. J. Bergholt, assistant treasurer. Mr. Allen joined Sinclair in 1921 and in 1946 was elected assistant treasurer, which position he still holds. Mr. Bergholt joined Sinclair in 1933 and was elected treasurer of the Sinclair Rubber Co. at Houston, Texas, in 1942. He returned to the New York office in 1945.

H. G. DENHAM has been elected president of Mid-East Crude Sales Co., Ltd., which draws its crude oil supplies from the Persian Gulf, particularly Saudi Arabia and Bahrein Island. His offices are at 551 Fifth Avenue, New York. Mr. Denham entered the petroleum business in China after his graduation from Brown University. He joined the Standard Oil Co., of California, in 1927 and later became assistant manager of the foreign trade department. Subsequently he has served as president of the California Commercial Co., manager of sales for Arabian American Oil Co., and most recently has been special assistant to the president, California Texas Oil Co., Ltd. Mr. Denham succeeds W. F. Bramstedt, who has returned to Caltex as a director and also executive vice president of the Caltex-Bahrein group.

H. G. Denham

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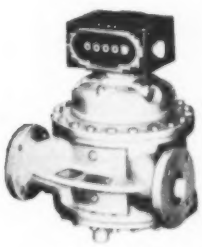

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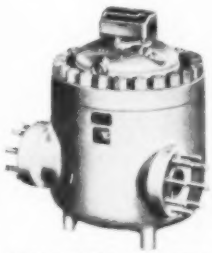

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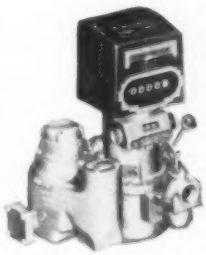

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Robert Siegel

ROBERT SIEGEL, formerly president of Socony-Vacuum Oil Co. of Venezuela, has been appointed manager of the foreign producing department of Socony-Vacuum Oil Co. Inc. Mr. Siegel has been with the company for 27 years. In that time he has been assistant to the director of production, secretary to the executive committee and assistant manager of the foreign producing department which he now heads.

PAUL JOHN BLATZ has joined the research staff of Houdry Process Corp. Dr. Blatz was instructor in the chemistry department of the Catholic University before joining Houdry.

JAMES H. PIPKIN, assistant to the president of The Texas Co. since 1944, has been named assistant to the chairman. J. T. Wood Jr., former Pacific Coast division manager in the producing department, has been made assistant to the president. E. R. Filley, manager of the producing department, has been promoted to general manager of that department, and J. H. Puls, formerly his assistant, succeeds Mr. Wood as division manager in the far west.

Mr. Pipkin, a native of Texas, joined the Texaco legal department at Houston in 1934 and transferred to New York in 1942. Mr. Wood joined the company as a geologist in 1929 and subsequently was transferred to management positions on the Pacific Coast.

Mr. Filley, the new manager of the Texaco producing division, is a veteran of 35 years with the company. After many years in the Oklahoma-Kansas division, he became assistant manager of the producing department at Houston in 1938 and became manager in 1947.

E. C. BOTHWELL, vice president of Gulf Oil Corp. in charge of production and exploration activities, both domestic and overseas, has been elected a director to succeed John E. Nelson, retired. In the future his efforts will be devoted to general corporate matters and to the overall direction of Gulf's extensive domestic and foreign production interests. The company's production and exploration activities in the United States and Canada will be under the direct supervision of K. C. Heald who will also continue to assist Mr. Bothwell with respect to overseas operations. He has been a Gulf vice president since 1945.

Mr. Bothwell's career in the oil industry began soon after the turn of the century when he left his home in Toledo, Ohio, and moved to Oklahoma. As a member of one of the early Oklahoma oil companies, he pioneered in the development of Glenn Pool, the first great oil field in Oklahoma. In 1915 he joined Gulf at Tulsa and the following year was brought to Pittsburgh as assistant to the vice president in charge of production. He was elected a vice president in 1935.

FRED J. FUNK, assistant to the manager of production for the Ohio Oil Co., has been made manager of the company's new foreign division. Initially the foreign division's active operations will be confined to Canada. The production department is actively engaged in acquiring substantial acreage of prospective Canadian oil lands. A district office at Calgary, Alberta, will direct Canadian operations. D. J. Griffin has been advanced from Casper division landman to Calgary district manager.

D. A. SHOCK has been appointed senior research chemist in charge of the production chemistry group in Continental Oil Company's production laboratory, it was announced by H. H. Hinson, chief production research engineer. Mr. Shock resigned from the research staff of the University of Texas at Austin, where he had been in charge of corrosion research problems, including those sponsored by the Natural Gasoline Association of America.

DAVID M. LILES has been named superintendent of Stanolind Oil and Gas Company's Stano gasoline plant near Ulysses, Kansas. He succeeds C. J. Tighe, who is transferred to Andrews, Texas, to become superintendent of the South Fullerton gasoline plant being built by Stanolind. The South Fullerton plant will be completed early in 1950. Mr. Liles was plant foreman of the Stano plant, going to Ulysses last December. He is a 20-year man with Stanolind and is a veteran of gasoline plant, cycling plant and refinery operations.

To Install Houdriflow Unit

The Salt Lake Refining Company will install a Houdriflow catalytic cracking unit at its Salt Lake City, Utah, refinery, Brigadier General D. N. Hauseman, president of Houdry Process Corp., has announced. The new unit, which has a design capacity of 10,000 barrels per stream day, will be added to the present refinery which started operations within the past year. The new Salt Lake Houdriflow unit brings the total capacity of the improved type Houdriflow units now being engineered and constructed to 76,800 barrels per day.

Roehm Heads Sales in Indonesia

M. D. Roehm, since 1946 Standard-Vacuum Oil Company's assistant area manager at New York for southeast Asia, has departed for Batavia, Java, to become general manager of Standard-Vacuum Sales Co. there. The sales company markets petroleum products throughout Indonesia. Mr. Roehm had served in Indonesia as a petroleum marketer from 1927 to 1941 and was assistant area consultant at New York for Australia and New Zealand during the early war years. He returned to Indonesia in 1945 to reestablish the company there, rejoining Standard-Vacuum in New York in 1946. Other officers of Standard-Vacuum in New York in 1946. Other officers of Standard-Vacuum Sales Co. are N. F. Tarbox, assistant general manager, and C. F. Scott, financial director.

M. D. Roehm

Ralph K. Paine

RALPH K. PAINE has been appointed manager of the pipeline department of Standard Oil Co. of California. He has been general superintendent of the Southern California district of the pipeline department since 1946. He succeeds Clyde A. Swigart, who has been elected a vice president of the Trans-Arabian Pipe Line Co. Succeeding Mr. Paine as southern district general superintendent is L. E. Joses. E. B. Saunders will be superintendent of the southern district. Both will have headquarters at La Mirada. E. J. Hyde becomes superintendent of operations control for the department with headquarters in San Francisco.

N. VAN WINGEN, professor of petroleum engineering of the University of Oklahoma, has resigned to join as vice president the consulting firm, Petroleum Technologists, Inc., in Montebello, Calif. Prior to joining the university staff, he had been associated for nine years with the Richfield Oil Corp., Los Angeles.

DONALD G. CLARK, director of purchases of Gulf Oil Corp. companies since 1939, has retired because of ill health. He will continue to act in an advisory capacity. The position of director of purchases is being discontinued, and Lee C. Bock, who has been general purchasing agent, will be in charge of purchases for all Gulf companies. Mr. Bock has been with Gulf for some 38 years.

J. R. McCREARY has been appointed manager of the crude oil purchasing department of Sohio Petroleum Co. He has been assistant manager of the department since April 1948.

D. J. Hanna

D. J. Hanna, 53, a vice president and director of The Bahrein Petroleum Co. Ltd. and of California Texas Oil Co. Ltd., died of a sudden illness on July 26 in New York City. Mr. Hanna was an outstanding figure in the oil industry, having been engaged in it since 1916. He first worked at the El Segundo refinery of Standard Oil Co. of California and continued there until he left for military service in World War I. After the war he was transferred to the Richmond refinery, of which he was made superintendent.

In August, 1940, Mr. Hanna was elected a vice president of the California Arabian Standard Oil Co., which was the predecessor of the present Arabian American Oil Co. which is so active in the Persian Gulf. He joined the Caltex-Bahrein group in 1941. He was particularly interested in the production and refining phases, and only recently completed a four-month trip through the Middle East, the Mediterranean and certain parts of Europe.

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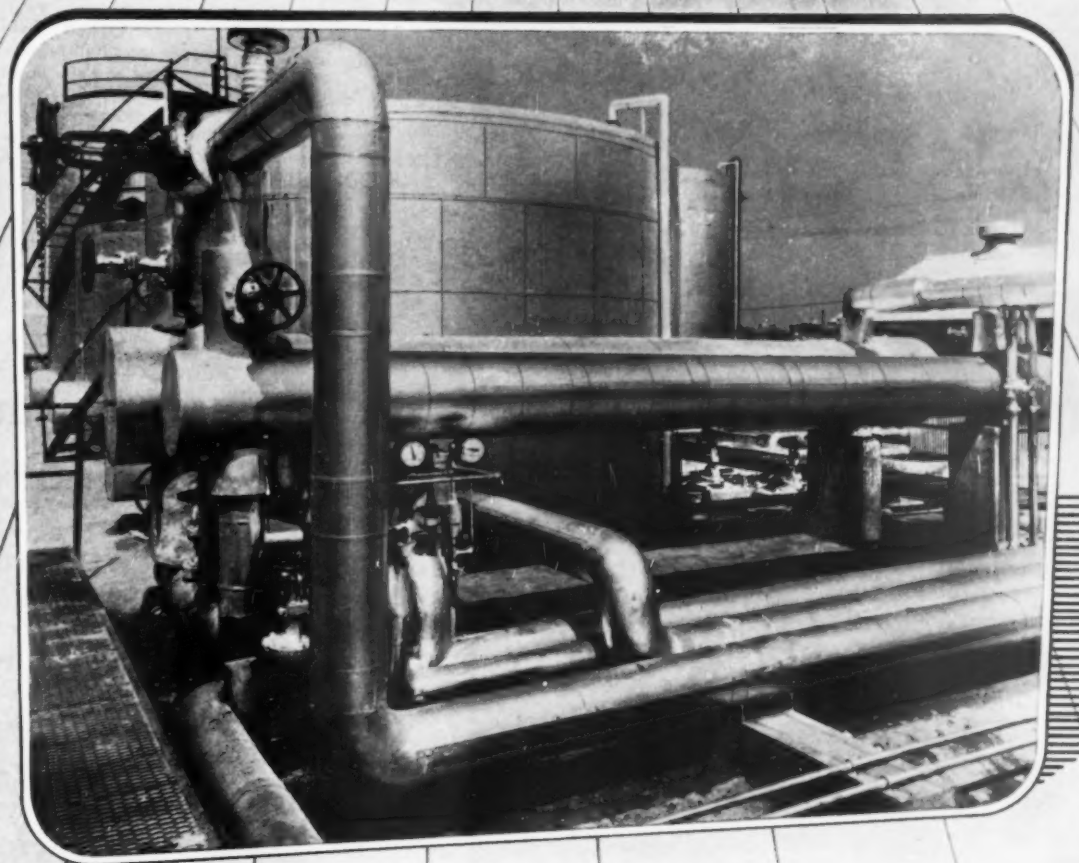

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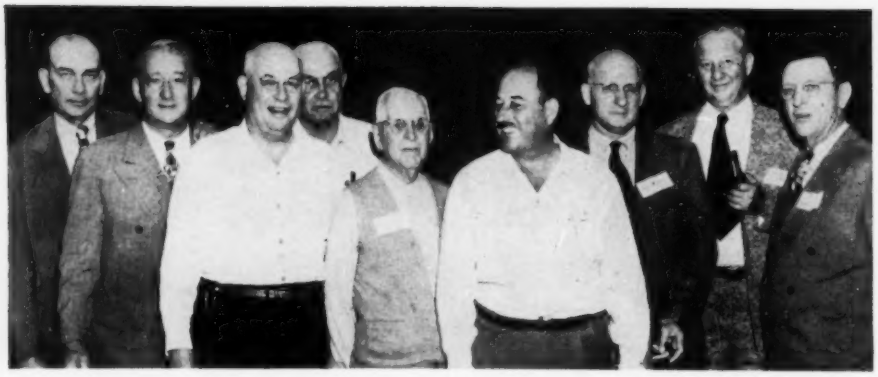


141 Years In Peru

These nine men, who attended a recent "Petroleum Production Pioneers" barbecue at the Shell barbeque grounds near Brea, California, have all seen many years of service in the oil industry and have lived a total of 141 years in Peru, South America. All of them except the three Fowks boys worked for the International Petroleum Co. in northern Peru. "Pop" Fowks, an ex-mayor of Paita, Peru, spent 32 years in widely separated areas of Peru in the oil, mining and rubber business. Al and Ernie Fowks were born in Paita, Peru. Reading from left to right: Lee "Lightning" Chisholm—10 years in Peru; Thomas A. "El Alcaldo" Murray—40 years and an ex-mayor of Talara, Peru; E. B. "Ernie" Fowks—seven years; A. S. "Al" Fowks—nine years; A. E. "Pop" Fowks—32 years; R. B. "Blockio" Block—12 years; A "Gerente" Norcott—17 years; F. D. "In The Chips" Ashton—nine years; S. P. "Duffy" Duffield—five years.

United Kingdom's Imports

Oil imports of the United Kingdom, including crude and products, during the first six months of 1949 amounted to roundly 70 million barrels as compared with 63 million in the corresponding period of 1948. Owing to the decrease in prices of certain products, the total value declined from £76.4 million to £75.3 million. The principal gains were in crude and motor fuel, while receipts of fuel oil and lubricants declined. The 50 percent increase in crude receipts consisted mainly of larger shipments from the Middle East. There was a gain of 33 percent in product shipments from the United States but a substantial decline in deliveries from the Caribbean area.

Bolivian Consumption

With the exception of fuel oil, consumption of petroleum products in Bolivia rose even more rapidly in 1948 than in previous years. Total increase was 54,742 barrels or 13.9 percent, to 442,885 barrels. For the first time the country produced more crude oil than it consumed in products. Production rose 86,198 barrels to 463,560 barrels. The entire increase was in the Camiri field which increased its output more than 100,000 barrels.

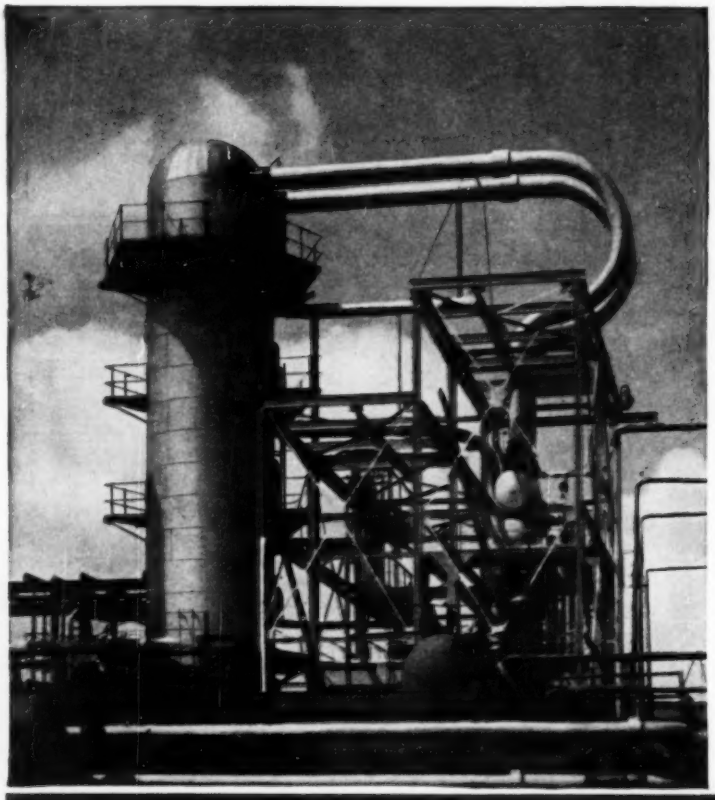
Consumption of motor and aviation gasoline increased 48,697 barrels or 17 percent to 336,842 barrels. Diesel fuel demand rose 8,271 barrels or 33 percent to 26,556 barrels, while fuel oil consumption dropped 25 percent to 29,022 barrels. Kerosene consumption was up 14 percent to 50,465 barrels.

Short Course On Instrumentation

The Agricultural and Mechanical College of Texas at College Station, Texas, will offer its fourth short course on instrumentation for the process industries on October 12-13-14, 1949. The course will be conducted as a seminar with lectures and discussions on the subject of automatic control. Cooperating with Texas A & M in the presentation of this course will be many industrial concerns manufacturing oil, gas and chemical products. Manufacturers of instruments and automatic controls, likewise, are taking part by arranging to show educational exhibits and provide capable lecturers for many of the sessions. Registration open to all.

New Register Published

The 27th edition of The Petroleum Register is just off the press and ready for distribution. Completely revised and with 5,000 new listings, the 600-page volume covers the oil and allied industries in 130 countries. Price per copy is $15 postpaid from The Petroleum Register, 318 South Central Ave., Los Angeles 13, Calif.



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BERMUDEZ CONSIDERS REBUILDING MEXICAN PRODUCTION A 10-YEAR JOB

Mexico City

SUSPENSION by the Mexican government of negotiations for loans and credits to finance Pemex's ambitious works and operations program had interesting reactions in Mexico. The Mexico City press had several field days of making accusations that Standard Oil and the U. S. State Department sabotaged the loan. "Mexico has been the victim of the sordid intrigue of Standard Oil. The powerful company impeded the loan. The New Jersey octopus exercises a baleful world influence," said front-page banner lines on a local story in *Excelsior.*

"We are poor but proud. We may become a corpse but never a worm," *La Prensa,* tabloid, charged in a locally-prepared news story that the loan was killed by Edward Miller, whom it branded as "the enemy of Mexico." It alleged that Mr. Miller, an ex-under Secretary of State, in his capacity as a lawyer has been waging a case against the Mexican government for the past 13 years. He, more than anybody else, charged the story, "sabotaged" the oil loan.

"Never will we stick our neck in the noose of such requirements" (reported U. S. government demands to guarantee the loan), *Novedades* said editorially. "There will soon be such a world-wide demand for oil that loans will shower on us without our asking."

In a press statement the socialistic groups of the Mexican Republic, which avow they are anti-communist, declared that Standard Oil works for the Kremlin because, as they alleged, it thwarted the loan-credits and thereby split the united democratic front against the reds. The groups charged that Standard Oil "slyly sabotaged the negotiations by manoeuvering for such burdensome and humiliating conditions that Mexico was obliged to suspend the negotiations."

Senator Antonio J. Bermudez, Pemex director general, was silent about the loan-credits negotiations suspension, but did give a press interview to discuss Pemex operations, in which he said that, "despite the precarious economic situation of the national oil industry, I cherish the firm conviction, free of false optimism, that in less than a decade it will be in a position, by itself, to put afloat our economy. We have the task of restoring that which was destroyed or that which lack of care failed to conserve and improve in a quarter of a century. Had we sufficient resources, that transcendental task could be accomplished in two or three years. But in the condition in which we find ourselves, it will be the work of a decade, but we will do it without vacillation and without any doubt."

Regarding the acquisition of machinery and equipment for the oil industry, Senator Bermudez said that there is a surplus of oil country goods in the United States that is being offered Pemex at about half the price of other times. He said that Pemex is considering various propositions made by Mexican capitalists as well as combinations of Mexican and foreign capitalists and others entirely foreign for contracts completely financed by them, amortizable in comfortable periods.

"All are reputable companies, among them three groups of Monterrey capitalists associated with Americans, each of which offers to provide no less than 50,000,000 pesos ($5,750,000). There is also the advantage that there will be sufficient dollars for operation, which would exempt the Bank of Mexico's reserve from facing the consequent investment of money.

"Regarding increased prices of gasoline and other Pemex products, it must be said that present prices are undoubtedly the lowest in the world, which would not be a problem did it not mean a heavy loss for the company added to the others I have cited. It is elemental that an industry like Pemex, so pressed for resources for its sustenance, must not make a sacrifice for a privileged class such as that which possesses automobiles for its personal use."

Gasoline prices have been raised to new highs of 40 centavos a liter for Mexolina (70 octane) and 50 centavos for Supermexolina" (80 octane). Urban and interurban buses and other automotive transportation vehicles are exempted from these new prices, and like exemption is promised home users of gas. Mexico City for-hire automobiles, miscalled taxis, were permitted to raise their rates in proportion to costlier gasoline. Pemex is making efforts to nip a black market in gasoline prompted by the increased prices and exemptions. The National Highway Association declared in press statements that the gasoline price hike is just and acceptable.

Almost coincident with announcement of the loan negotiation suspension came announcements of various plans for Mexico to help Pemex help itself. Prominent among these was the Senate-sponsored proposition to raise 1,500 million pesos by issuing domestic bonds, part to be sold to bankers, industrialists, businessmen and other top investors to buy equipment in Europe—it was proclaimed that the United States is not the only country that has oil equipment to sell—and part to the rank and file of Mexicans, these bonds to bear 15 percent and perhaps more interest. The plan got as far as the detail that the bonds would range in value from 50 to 100,000 pesos and the statement by the Nacional Financiera, the government's fiscal agency, that it had not and did not expect to participate in this bond issue and that it had not been officially informed of the plan.

Luis Montes de Oca, important banker who was finance minister through three successive presidential administrations, told the press that the bond issue is not feasible because there is not enough ready money in Mexico to raise the amount Pemex finds necessary for its vast works and operations program. The Confederation of Chambers of Commerce said that, while on the face of it the slightly more than 2,000 million pesos in sight deposits in the bank should easily cover the 203 million dollars, (a bit more than 1,700 million pesos, that Pemex estimates the plan costs), money is not available because much of it is invested in industrial, commercial and agricultural loans and withdrawing it from them would provoke a grave economic crisis.

Pemex announced the bringing in of well Escolin No. 2 in the Poza Rica fields. It had an initial production of 1,480 barrels daily. Senator Bermudez announced that 150 wells will be drilled this year. The yearly average has been 67, he said. Pemex, he reported, has sufficient equipment to drill 130 to 140 wells yearly, but its goal is 300 a year.

Drilling by the American independents—Edwin Pauley, American Independent Oil and Signal Oil—under the agreement of last March 5, is expected to start with two wells about the end of September, after the rains that hamper operations in the tropics. Bart W. Gillespie is general manager of the Mexican operations. Offices have been established in Mexico City and a branch at Coatzcoalcos (Puerto Mexico), Vera Cruz, under the name of Mexican-American Independent Company.

One well will be drilled on shore within 27 kilometers (18 miles) of Coatzcoalcos, and the other in the zone of Ciudad del Carmen, Campeche, Mr. Gillespie explained. Rigs for both jobs are scheduled to be delivered late in August by Kerr-McGee of Houston, Texas, which it is understood was low bidder on the drilling contract. Drilling in Tabasco continues to be considered, and plans for submarine operations to about a five-kilometer limit off Vera Cruz are in process.

No announcement has been made regarding work in progress under the deal between Cities Service interests and Pemex. Neither is willing to give out any information at this time.

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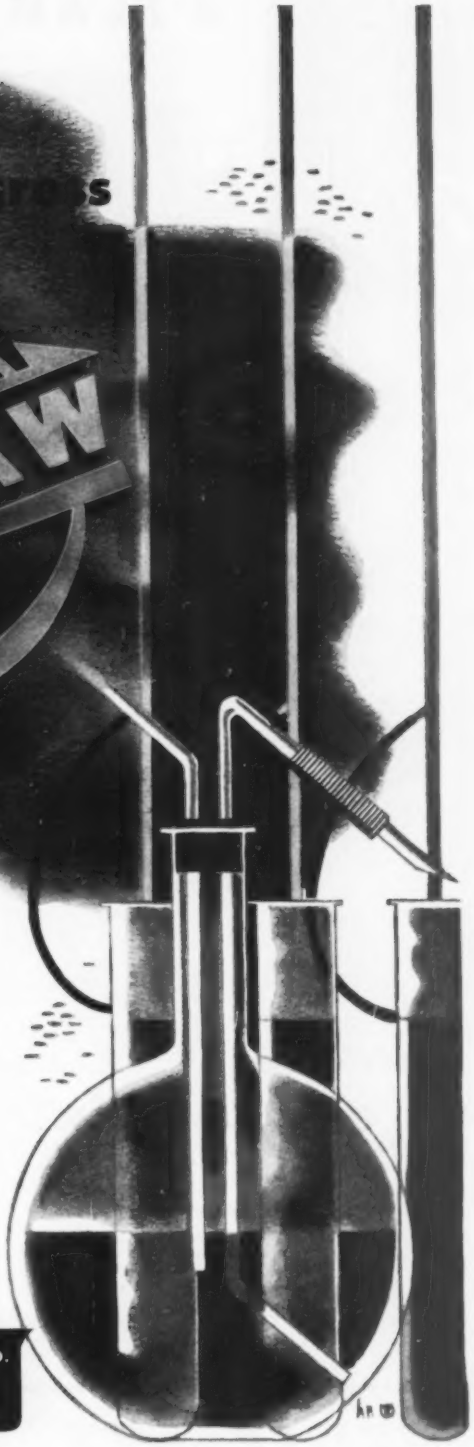

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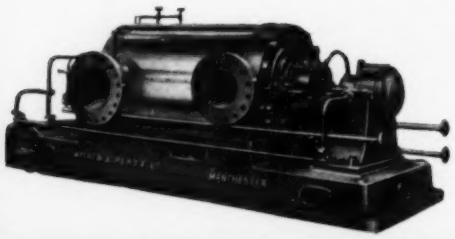

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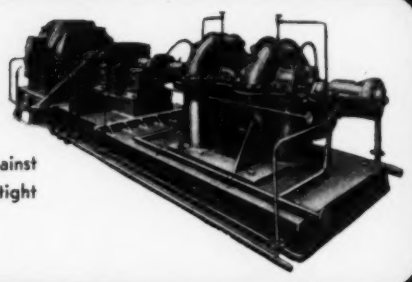
Transfer and Loading Pumps



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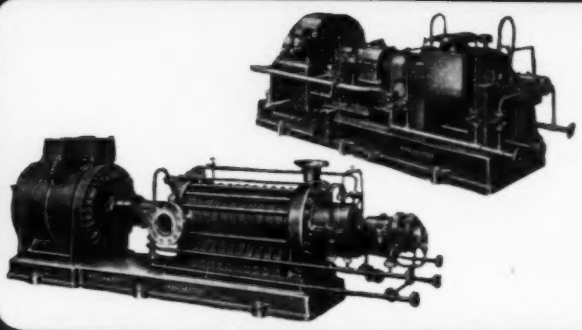
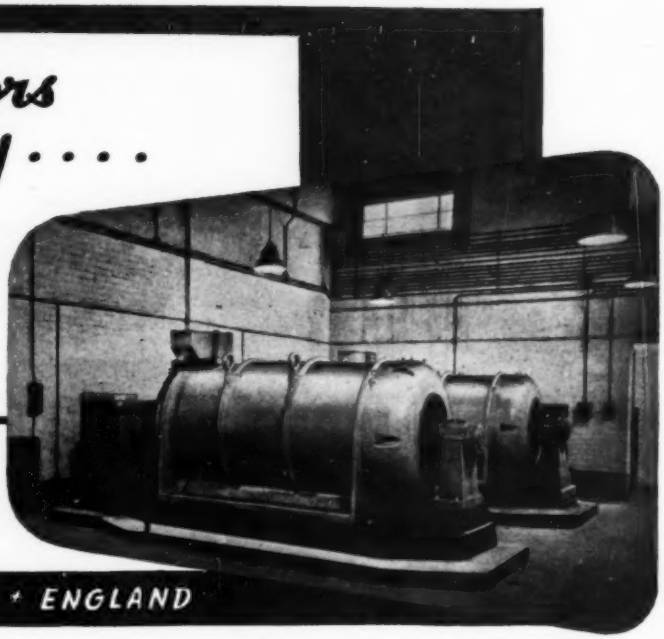
Refinery Process Pumps



Our long refinery experience at home and abroad enables us to supply pumps for the most arduous refinery duties. The illustration shows typical units:—a steam turbine driven pump handling oil at 500 degs. F. and a motor driven "Plurovane" pump dealing with light volatile hydrocarbons.

Flameproof Motors on Pipeline Duty....



Mather & Platt electrically-driven centrifugal pumps on an oil pipe line. The motors here illustrated are of the totally enclosed flameproof type, and are of 1,000 h.p. capacity, fed from a 3 phase 50 cycle 6000/6600 volt supply. They are squirrel cage direct-on started machines with a starting current of four times full load value.

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Brazil Places Refiners Contracts

National Petroleum Council of Brazil has announced several important oil industry contracts. Final approval has been given to an agreement with the French consortium of Cie. de Fives-Lille and M. M. Schneider et Cie. for equipment of the refinery of 45,000 barrels daily capacity which the Council will establish, as previously announced.

A contract has been prepared with Pan American Hydrocarbon Research, Inc., subsidiary of Hydrocarbon Research, Inc., for engineering service, purchase of materials and supervision of construction and initial operation in connection with the refinery project. A further "contract of license" is to be concluded with Hydrocarbon Research for the right to employ its data and technical knowledge in relation to the catalytic polymerization of hydrocarbons.

Agreement has been reached with Bechtel Corporation to act as adviser to the Council in relation to refining operations.

Announcement has been made by the Council that location of the new refinery remains still to be finally determined. The proposal to place it at Belem, Para, has aroused some criticism, and the question of site is receiving reconsideration.

Projected Venezuelan Refinery

Organization of a Venezuelan corporation, compania Venezolana de Refinacion de Petroles S.A., is reported from Caracas. According to this report, the company is seeking a contract to process the government's royalty oil and, if successful in this, proposes to erect a refinery of 25,000 barrels daily capacity at Puerto La Cruz to handle it.

Compania Nacional de Petroles S.A. was formed earlier in the year by Venezuelan interests as a subsidiary of Compania Nacional de Industrias S.A. to engage in production, dependent upon obtaining concessions to government lands not covered by existing grants.

Peruvian Production Shows Increase

Oil production in Peru showed a considerable increase in the year 1948. Production of crude rose from 12,763,809 barrels in 1947 to 14,068,880 barrels in 1948 or roughly 10 percent. Production of natural gasoline increased from 1,000,754 barrels to 1,088,553 barrels, making the total production for the year 15,157,433 barrels against 13,764,569 barrels in 1947.

The increase of production is due chiefly to developments of the International Petroleum Co. in its Brea and Pariñas fields, where crude production rose from 10,205,658 barrels in 1947 to 11,362,498 barrels in 1948. Correspondingly the recovery of natural gasoline from casinghead gas increased from 890,848 barrels in the former year of 971,806 barrels. The increase in production was due to the company's drilling activity which reached a total of about 500,000 feet, a gain of nearly 50 percent.

Production of the Cia. Petrolera Lobitos increased from 2,321,967 barrels in 1947 to 2,472,969 in 1948. Introduction of rotary drilling in the Lobitos field allowed faster drilling, while in the El Alto field cable tool equipment is still employed. The yield of natural gasoline rose only from 109,906 barrels in 1947 to 116,747 barrels in 1948, because it is recovered only in the Lobitos field, which supplies about one-third of the total crude production of the company.

Production of Ganso Azul Co., the only producing field in the Montaña east of the Andes, advanced only from 118,001 barrels in 1947 to 120,810 barrels in 1948 because of the lack of shipping facilities for export on a larger scale through Iquitos.

Production of the government-owned Empresa Petrolera Fiscal has remained stationary, yielding 112,603 barrels in 1948 against 118,174 barrels in 1947 because of the impossibility of enlarging production in the Organos field without modern rotary equipment. For the same reason no deeper drilling in Zorritos or exploration of favorable structures in the Tumbes Reserves could be accomplished.

On the coast there has been no exploration activity in new fields. In the Montaña the Compañia Nacional de Petroleo El Oriente has started an exploratory well in the structure of the Rio Pisqui which reached about 3,500 feet in the Red Beds of the Tertiary.

The new government has named a commission, in which the oil industry and EPF are represented each by one member, to propose a new oil law.

Builds Benedum Field Plant

Texas Natural Gasoline Corp. of Tulsa is building a 55-million cubic foot natural gasoline plant in the Benedum field in Upton and Reagan Counties, Texas, according to an announcement by John T. Oxley, president. It is located on the Dixon lands in the center of the Benedum field, which was discovered by Slick-Urschel Oil Co. of San Antonio, Texas. The plant is being constructed jointly by Texas Natural and Slick-Urschel. Texas Natural is designing, processing and engineering the plant, which does not include a steam generating plant and is unusual in that it has eliminated the conventional type of deethanizer. This design was originally pioneered by members of the engineering staff of Texas Natural Gasoline Corp. Texas Natural will also be the operator of the plant and will market the product.

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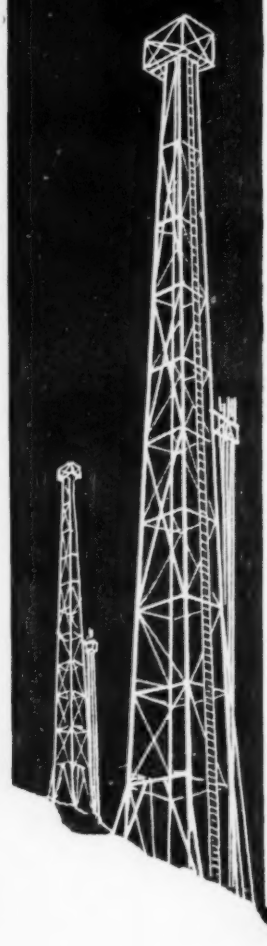
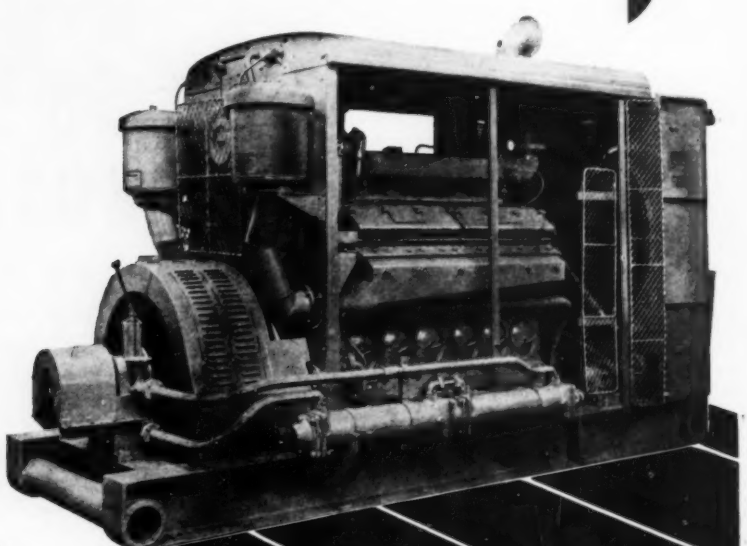
Paxman power plants for oil-well drilling range in output from 200 to 800 b.h.p. and combine a high performance with durability and the light compact design essential to mobility.

The diesel engines employed are economical on fuel consumption and comprise easily handled and self-contained sub-assemblies by means of which servicing operations are reduced to a minimum.

Whilst drilling units can be made to special requirements, the standardised Paxman "package" unit illustrated is almost universally adaptable to any type of drilling rig. This self-contained set includes engine, hydraulic coupling, radiators, control gear, steel side canopy and starting equipment, etc., all mounted on a skid-type underbase, and as a complete entity can be lifted off or replaced without disturbing anything other than the internal-gear-type power take-off coupling.

Paxman power units for oil-well drilling are backed in service by a comprehensive spares programme ensuring the highest availability in any part of the world.





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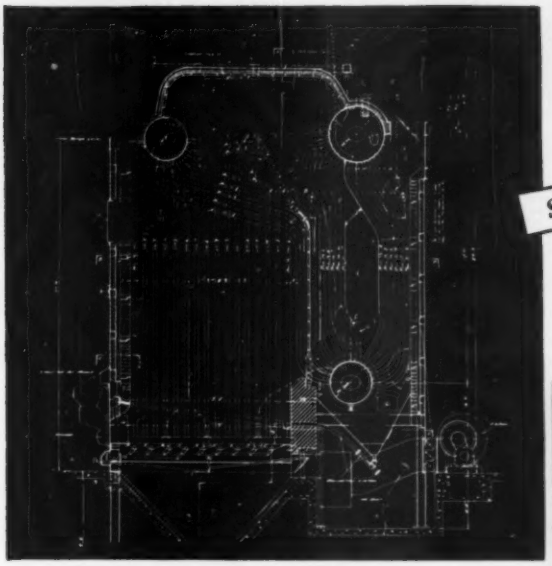

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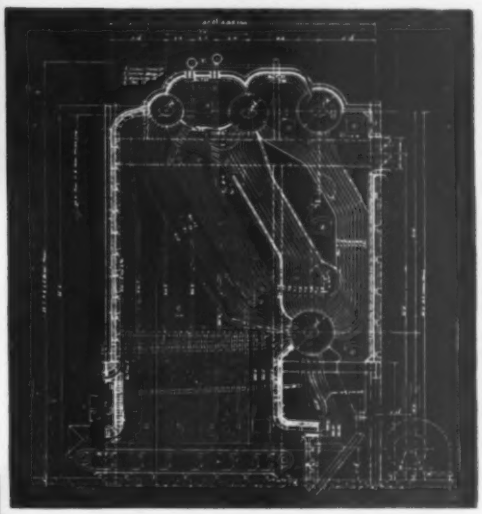
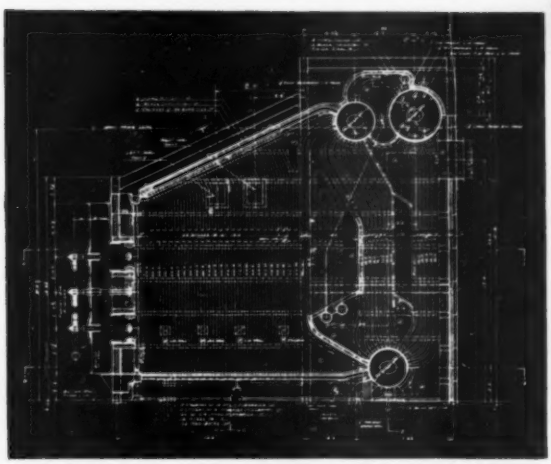


CLASS VL — Two 27,500 pounds per hour units, installed at Brown-Forman Distillers Corporation, Louisville, Ky. Features large furnace volume in limited space, with high ratio of radiant heating surface.

CLASS LE — Mr. Carmel Public Utility, Mr. Carmel, Illinois, is served by this 60,000 pounds per hour unit. Generous steam liberating surfaces and steam space permit wide fluctuations in load.

CLASS VR — 70,000 pounds per hour steam generator at Humble Oil and Refining Company, Johnsue, Texas. An efficient, high-duty unit with water cooled furnace, using refinery gas fuel.



Vogt builds a complete line of bent tube steam generators, designed to burn solid, liquid, or gaseous fuels to meet specific operating conditions. Superheaters, air preheaters, economizers, water walls, and soot blowers can be readily incorporated. Bulletins with general information and showing typical installations are available upon request.

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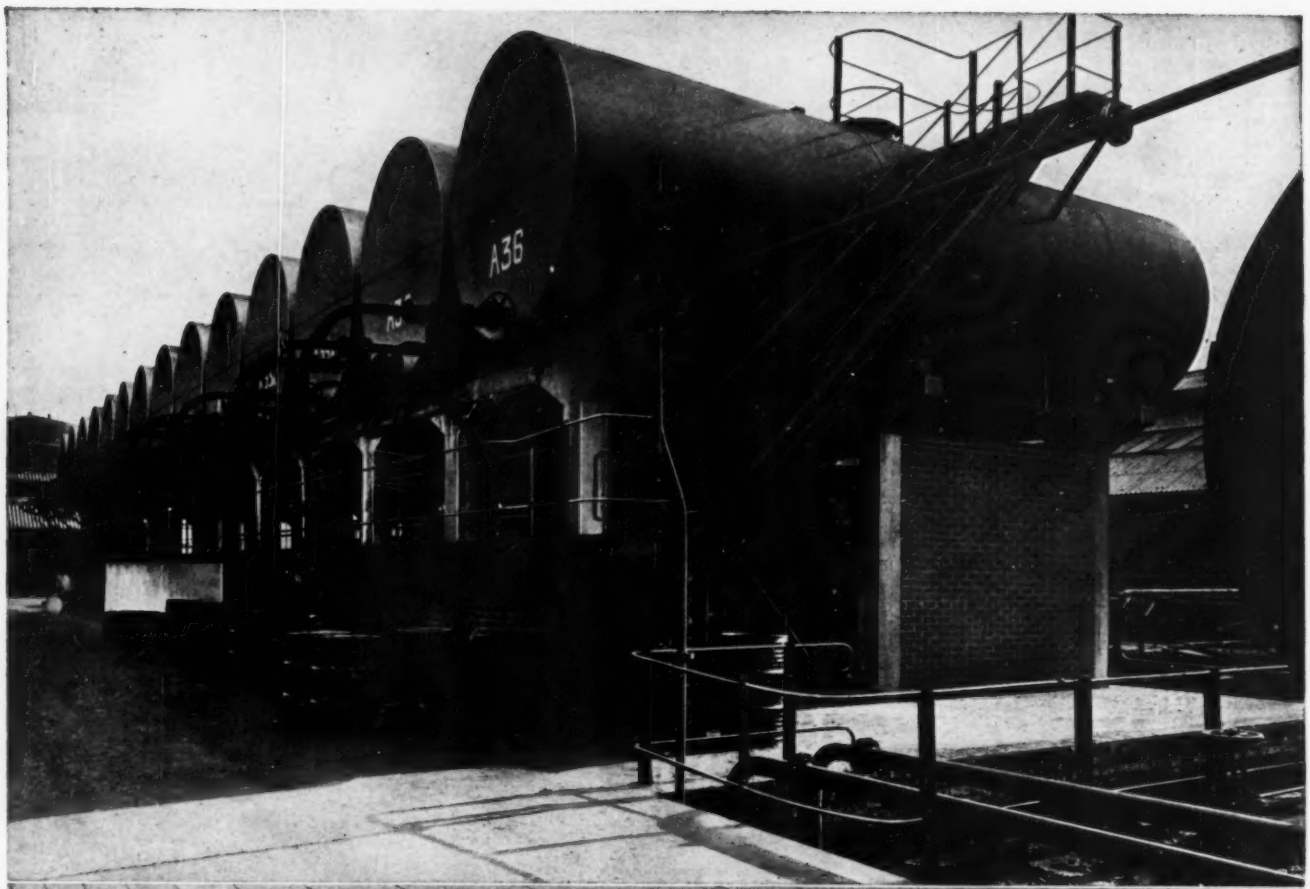

OXLEY

WELDED STORAGE TANKS

A close-up view of a battery of fourteen welded storage tanks each 9'0" diameter by 30'0" long with connecting platforms and access staircases.

Erected and installed by Oxley at Ellesmere Port, Cheshire, England, for Lobitos Oilfields Ltd., who gave permission for this photograph to be taken.

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Oil Field Service Man Honored

Carl Leidecker, electrolog operator with Lane-Wells, technical oil field service firm, was recently awarded the Silver Star for valor in combat. He received this honor as the result of his heroism while serving with the U. S. Marine Corps. Mr. Leidecker extinguished a fire that started as a result of a Japanese shell hitting an ammunition dump on Tinian, Marianas Islands, July 24, 1944, and is credited with saving many lives.

Australian Refinery on Stream

Process operations have started in the 1,200-barrel-a-day Altona refinery of Vacuum Oil Company Pty. Ltd. near Melbourne, Australia. The new plant will process more than 400,000 barrels of selected crudes a year into nearly five million gallons of high-grade industrial lubricating oils which now have to be imported by Australia. In addition Vacuum will produce here 129,000 barrels of diesel oil a year, 113,000 barrels of asphalt and a small quantity of gasoline. Establishment of the refinery will contribute a material saving in Australian dollar exchange.

Located on a 200-acre site six miles from Melbourne on Port Phillip Bay, Vacuum's Altona refinery cost $3,000,000 and will employ about 100 people. Tanker unloading facilities located on the Yarra River three miles away are connected to the refinery by pipeline. Crude will be received initially from the Tia Juana field in Venezuela and later from the Klamono field in western New Guinea. No commercial production of crude has yet been obtained in Australia.

West Texas Line Completed

The Basin and Ozark Pipe Line systems, together comprising the largest crude oil pipeline ever built by private capital in America, were dedicated July 12 at Cushing, Okla. Stretching 1,000 miles from Jal, New Mexico, via Cushing, Oklahoma, to Wood River and Patoka, Illinois, the completed lines provide transportation for crude from west Texas and New Mexico to the refining centers of the midwest.

The 515-mile Basin pipeline system, a combination of 20, 22 and 24-inch pipe from Jal to Cushing, has a capacity of 241,000 barrels daily. The 22-inch Ozark system from Cushing to Illinois will handle 186,000 barrels daily. The Basin system, built by The Texas Pipe Line Co., is owned by Texas, together with Shell Pipe Line Corp., Sinclair Refining Co., and Empire Pipeline Co. The Ozark system, built by Shell Pipe Line Corp., is jointly owned by Shell and Texas. The 54-mile extension to Patoka, Illinois, is owned by Texas. At Cushing, Oklahoma, and Patoka the system connects with lines of other companies.

QUALITY in world famous W-S Forged Steel Fittings starts with proper selection of basic metals. Long before problems of forging, machining and testing arise, W-S technicians concern themselves with end uses in the determination of proper steel analysis for the various jobs Fittings must perform.

For example, working closely with Refinery engineers, W-S technicians helped establish standards for the physical properties of various fittings alloys . . were first to use fitting materials of closely controlled uniformity (low sulphur-low phosphor) for the special demands of refinery services.

And, W-S has kept pace with changing methods in other processing industries too, meeting each new challenge with stronger, tougher alloys, producing forged fittings always correct — metallurgically.

They meet the broad, diversified needs of all industry and are available in both screw and socket weld types. Forged and precision machined of stainless, carbon and alloy steel . . . . Investigate.

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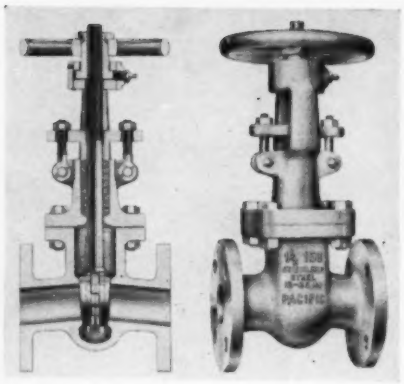
Distribute OIIC Film

Prints of the Oil Industry Information Committee's motion picture, "The Last Ten Feet," are being distributed currently to the district offices of the OIIC and to many oil companies and associations which purchased them for their own libraries. Special showings of the fast-moving 16 millimeter sound movie will be one of the features of Oil Progress Week, Oct. 16-22, when the industry makes a direct report to the people of the nation in virtually every community in the land. Prints are being made available at cost to the entire industry and to other interested associations and related firms.

The black and white motion picture in dramatic fashion tells the story of the oil industry and its spectacular array of contributions to the progress and comfort of man. The theme of the motion picture is built around the last ten feet of hose through which gasoline travels from a service station pump into the tanks of waiting automobiles and how this abundant supply of gasoline reaches the 250,000 service stations which dot the landscape from coast to coast.

Petroleum Club Organized

On August 1 the newly organized Petroleum Club of Los Angeles opened the doors of its quarters in the Biltmore Hotel. Officers of the club are R. P. Huggins, Western Gulf Oil Co., president; Henry Salvatori, Western Geophysical Co., vice president; Stanwood I. Williams, Pike Drilling Co., secretary; Howard C. Pyle, Continental Consolidated Corp., treasurer. Directors, in addition to the officers are Mortimer Kline, attorney; James G. Leovy, Western Gulf Oil Co.; Frank A. Morgan, Richfield Oil Corp.; R. W. Sherman, consultant; O. I. Torklesen, British American Producing Co.; and Thomas Sherman, Huntington State Co.



New Stainless Steel Gate Valve

Pacific Valves Inc. has added another line of cast steel valves—the 150-pound series stainless steel, O.S.&Y., bolted bonnet, gate valve with flanged or screwed ends. This new series is available in various sizes ranging to six inches. Bodies and bonnets will be regularly furnished case of 18-8 S MO stainless steel or case of alloy 20 (durimet 20) stainless steel. Trim material regularly furnished conforms to AISI specification type 316 stainless steel. All other important valve parts are of type 303 stainless steel with the exception of the nickel-alloy yoke sleeve.

To Enlarge Salt Lake Plant

Sale Lake Refining Company's refinery which went on stream in November 1948 is to be expanded at a cost of $10 million. The new equipment will include a catalytic cracking unit, additional storage for both finished and unfinished products, loading racks, feeder lines and other auxiliaries. The new cracking facilities are expected to be completed by the end of 1950. The existing facilities at the Salt Lake City plant consist principally of a crude distillation unit in two stages, an atmospheric pressure column and a vacuum tower. When the cracking plant is completed, the existing units will turn out cracking stocks and greatly increased output of diesel fuels. Heavy fuel oil output will be lessened. Crude throughput will be increased from 15,000 to 24,000 barrels daily.

New Vertical Heater

A simplified vertical, tubular heater, designed to hold initial and maintenance costs to a minimum, is the subject of a newly published brochure by Foster Wheeler Corp., New York. Included is a complete description for this simplified design which features the use of bare tubes and the absence of any metal parts exposed to furnace gases. The heaters are suitable for every process duty, and designs are available for heat absorption capacities as low as 1,000,000 btu's per hour.

Heads FWD Sales

M. O. Stockland, Jr., advertising and sales promotion manager for The Four Wheel Drive Auto Co., will become director of sales of the company on July 1. He succeeds Robert L. Koehler, who has resigned to become a distributor in California. Mr. Stockland has been with Four Wheel Drive since 1922. He has served as export manager, then sales promotion manager, to which was added advertising two years ago, and since the war he has been Mr. Koehler's assistant.

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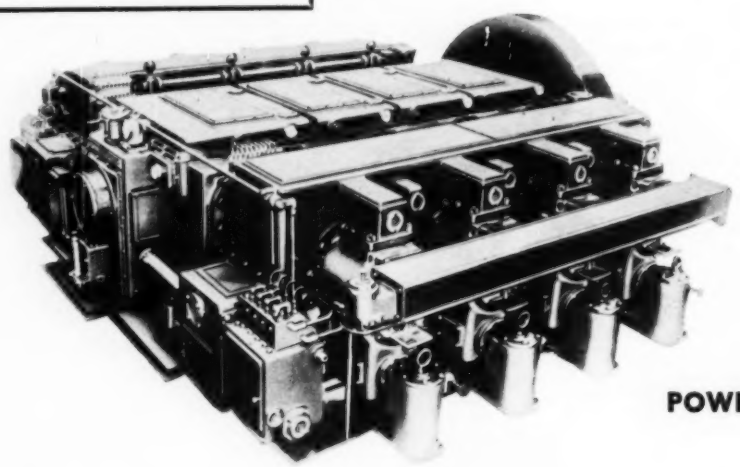

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MECHANICAL OCTANES AGAINST VAPOR-LOCK

AT the present time the manufacturers of automobiles and the manufacturers of gasoline are jointly concerned with a new phase of the problem that has interested both industries since the first automobile took to the road and that still presents new objectives with every passing year. This problem is to enable the motorist to ride more miles on fewer gallons of gasoline.

The automobile manufacturers have long known one answer to this problem. It is to design automobile engines with higher ratios of compression. A great deal of progress has been made in this direction and the oil industry has co-operated by providing higher and higher octane fuels so that the higher compression ratio motors will operate satisfactorily.

The gasoline manufacturers have also suggested that the car builders might find it possible to increase the economy of their engines without necessarily requiring a gasoline of higher octane number. Arguments along this line have led to a broadening of the meaning of the word "octane" as used in discussions on the functioning of an automobile engine. In this broader sense "octane" can be conceived as a unit of measurement for any device whereby an automotive engine can be made to operate more efficiently. There may be chemical octanes and mechanical octanes; chemical octanes are enclosed in the chemical composition of the gasoline; mechanical octanes are built into (or left out of) the engine and may contribute decisively to the efficient operation of the fuel in the engine. A well designed engine will carry the motorist farther per gallon of the same gasoline than a poorly designed engine that has the same compression ratio.

The oil industry lately has called new attention to one defect of current automotive engines which, in the opinion of some, has not been given sufficient attention by many designers. This is the matter of "vapor-lock." Were it not for vapor-lock, the gasoline manufacturers could easily increase the thermodynamic efficiency of motor fuel simply by increasing the proportion of light fractions—principally butane—in the gasoline. The oil industry would welcome the chance to include 10 percent more of butane in premium gasoline.

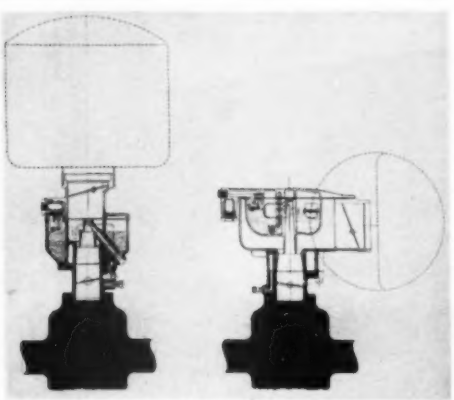
How the General Motors Corporation has approached this matter of mechanical octanes and vapor-lock was described by J. M. Crawford, vice president of the company, in a talk at a symposium of vapor-lock problems at the API Refinery Division meeting at Houston last April. As an old-timer he could recall that gasoline in the early days of the automobile had a distillation end point of 235°F, with a difference of only 85° between the 10 percent and the 90 percent points, and even with such volatile fuel, there was no vapor-lock problem at all, because with aluminum manifolds of small diameter, high gas velocity, vented carburetors, well ventilated hoods, and two pounds of pressure on the rear gasoline tank, there was no mechanical occasion for vapor-lock. In succeeding years gasoline end points went up to 284° and on to 437°F, and were low in vapor pressure. To obtain necessary volatility of the heavy ends, the engines were designed for heating the intake air and for hot-spotting the manifolds in order to give sufficient heat to this coarser fuel. This meant that the gasoline could not have a high Reid vapor pressure or vapor-lock would come into the picture.

General Motors Corp. developed the 1949 Cadillac engine with a higher compression ratio and which requires gasoline around 88-90 octane number. Vapor-lock also was given careful consideration. So far as this new overhead valve engine is concerned, the matter involved the securing of a lower underhood temperature, for which purpose the exhaust manifold was located down on the side, away from the inlet. Some other factors came into the picture, but that is the primary one.

As a result of this arrangement, the temperature at the pump outlet is 13° to 15° lower than in the 1948 Cadillac at 80 miles per hour and 100°F outside air. The temperature of the carburetor of the 1949 car is 16° to 34° lower. The cost of this development has been heavy and would not have been justified for this purpose alone, but so long as the engineers were designing a new engine for higher compression, the vapor-lock problem could be taken into consideration also.

This problem was given recognition in another way in connection with the Oldsmobile engine, which has also had its compression ratio raised. The redesign of this car was undertaken primarily from the standpoint of safety while retaining the good performance factors. To maintain vision the overall engine height had to be reduced, with the carburetor on top of it. This required the design of a new carburetor which would take into account both the vapor-lock and the oil industry's desire to increase the use of butanes. With these problems in view, the new Rochester carburetor was invented which, among other things, was given a horizontal instead of a vertical air-cleaner, which is thinned out and draped around the carburetor; the result is that the float of the Rochester carburetor is 27°F cooler than the bowl of the conventional carburetor (which is attached to the throttle body) during the warming up; it stabilizes at 14°F lower and does not rise above the temperature of the fuel.

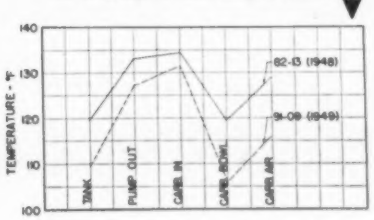
In many respects the engineering and commercial problems connected with high-vapor-pressure fuels are similar to those associated with high-octane fuels. The car builders have designed new engines that can take full advantage of higher octane fuels. The question then is, where do the car builders and the gasoline manufacturers go from here in their joint service to the motoring public? Mr. Crawford admits that the car builders will have to depart from their past procedure and design their equipment so as to take advantage of higher vapor-pressure fuels sufficiently ahead of the introduction of such fuels so as to insure a high percentage of cars in service when the higher vapor-pressure fuels are put on the market for general use. The date of realization of this ideal will depend on how soon the car builders can make the change-over. The oil refiners can supply plenty of butanes and other chemical octanes when the engine builders can provide the necessary mechanical octanes.

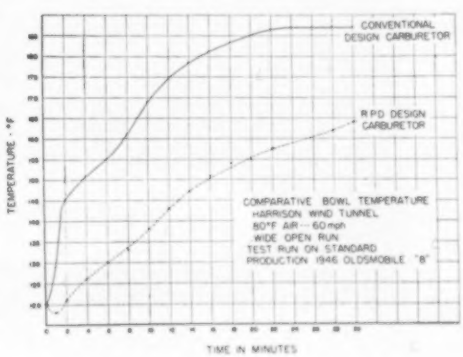


New Oldsmobile carburetor illustrating methods of keeping heat from bowl. Shading indicates heat intensity in new design as compared with previous carburetor.

Chart showing differences in bowl temperature of new Oldsmobile carburetor after wind tunnel testing.

Temperature rise through fuel system during road test at 30 mph in Black Canyon, Arizona.





Creole and Pantepec Dissolve Venezuelan Partnership

The Creole Petroleum Corp. and Pantepec Oil Co. have revised their partnership on drilling operations in Venezuela and have replaced it with three agreements.

According to the first or termination agreement, each company will assume title to its own particular concessions. In return for two parcels at Mulata, Pantepec transferred all of its interests in the Temblador field to Creole. The facilities that served both companies in the Mulata area, such as the stabilization plant, the gas repressuring system, main flow stations, power and water distribution, will be used jointly as before.

The second agreement is concerned with drilling and producing. Creole will operate concessions transferred to Pantepec, but at the latter's risk and expense. In the Mulata field Creole will operate only one rig, not more than five in El Roble field and will use its best efforts to complete 18 wells by August 1951.

In connection with the third or joint facilities operation agreement, subject to termination by August 1951, Creole will operate jointly-owned facilities on a cost plus 10 percent basis in both Roble and Mulata. Creole will underwrite a bank loan up to $3,000,000 for which Pantepec will give the bank a mortgage on the Mulata and El Robble concessions, which will be transferred to Creole in case of default.

Sunray Adds Pipeline

Sunray Oil Corporation has completed a six-mile four-inch welded pipeline to deliver crude from the South Palacine pool to the company's refinery at Duncan, Oklahoma. The line is handling 700 barrels per day from wells on the company's leases and other connections.

Forms Canadian Company

M. O. Johnston, pioneer oil man and oil tool manufacturer, has formed the M. O. Johnston Oil Field Service Ltd. with headquarters at Edmonton, Alberta, to serve the expanding needs of Canadian operators. Joe Barlow has been appointed manager. The establishment of Canadian facilities makes a total of 35 Johnston service locations furnishing Johnston formation testing and Johnston Shoot-N-Test gun perforating.

Communist Control of Hungarian Oil

Anglo-Saxon Petroleum Co., Ltd., a member of the Royal Dutch-Shell Group, has issued a statement recounting the steps by which its Hungarian subsidiary, Shell Koolaj R.T., has been virtually confiscated by the communist government of Hungary. Beginning by fixing the price of oil below the cost of production, the government followed this up by imposing confiscation taxes including a huge levy for alleged "unjustified surplus profits obtained in the postwar years." Immediate payment of trumped-up claims was demanded. The company was compelled to operate its refinery entirely for government account, and a government official was put in charge, depriving the owners of all control. Attempts to negotiate a settlement brought no result, and finally the company was forced to disclaim responsibility for the further conduct of the business, denouncing the action of the authorities as a violation of the peace treaty, the treaty between the United Kingdom and Hungary and the principles of international law.

The steps taken to deprive the owners of Shell Koolaj of their property were very similar to the course adopted toward MAORT, the Hungarian subsidiary of Standard Oil Co. (N. J.) Elimination of these two companies leaves the communist government in control of Hungary's oil resources, which are being operated for the benefit of the Soviet Union with most of the oil produced going to the USSR.

World Tour In Oil

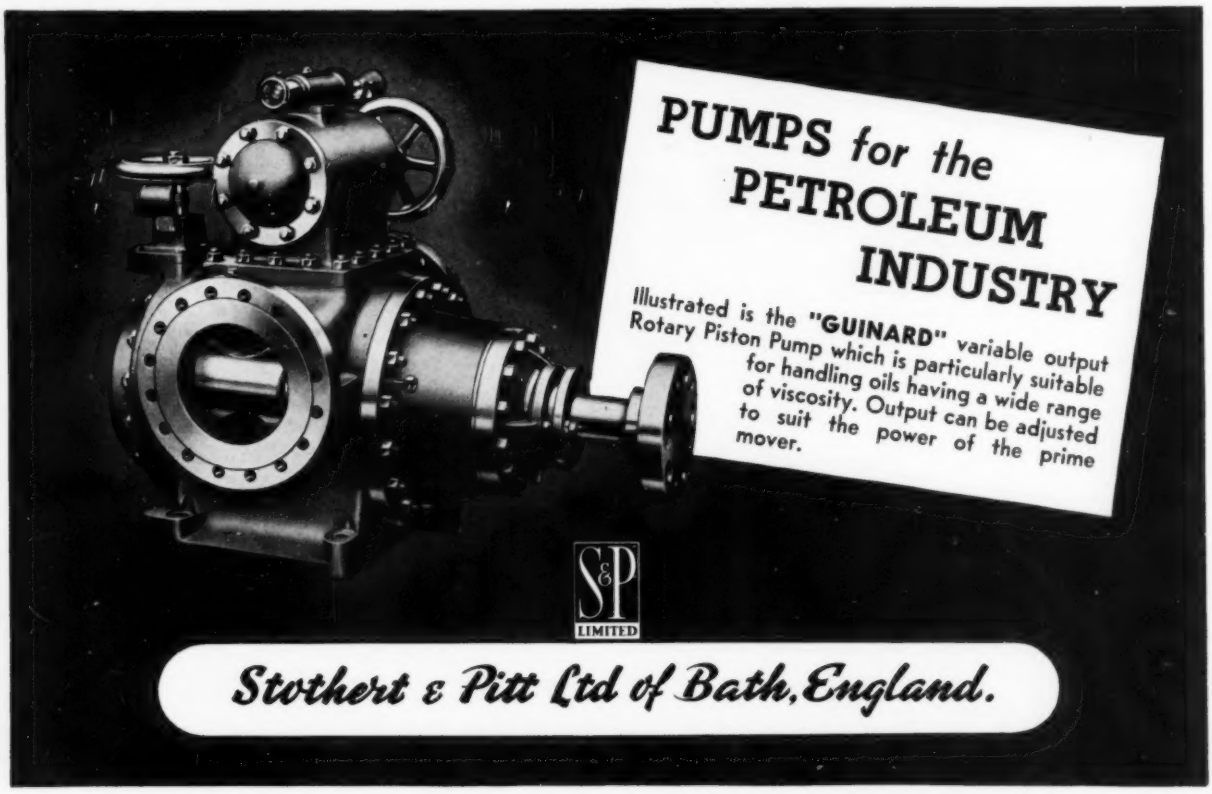
In 1948 Dr. Alfred M. Leeston, economist and lecturer on international trade at Southern Methodist University, Dallas, Texas, published a little booklet under the above title for circulation among his friends. It contained brief descriptions of the various oil-producing countries based on the author's personal experiences in visiting foreign lands, conveying much useful information presented in chatty and informal style.

Demand for the small volume was so great that it has been reprinted in a larger and more attractive edition which is offered for sale and which should attract a broader number of readers.

"A World Tour in Oil," 35 pages with maps and other illustrations. Price 50 cents. Dr. Alfred M. Leeston, Continental Bldg., Dallas, Texas, U. S. A.

Study Coke Plant Installation

The Frontier Refining Co., Cheyenne, Wyo., has retained Refinery Engineering Co. of Tulsa to study possibilities of a coking unit at the Cheyenne refinery. If installed, the unit will produce a coke of low volatility. Preliminary surveys suggest that a nearby market exists for the coke.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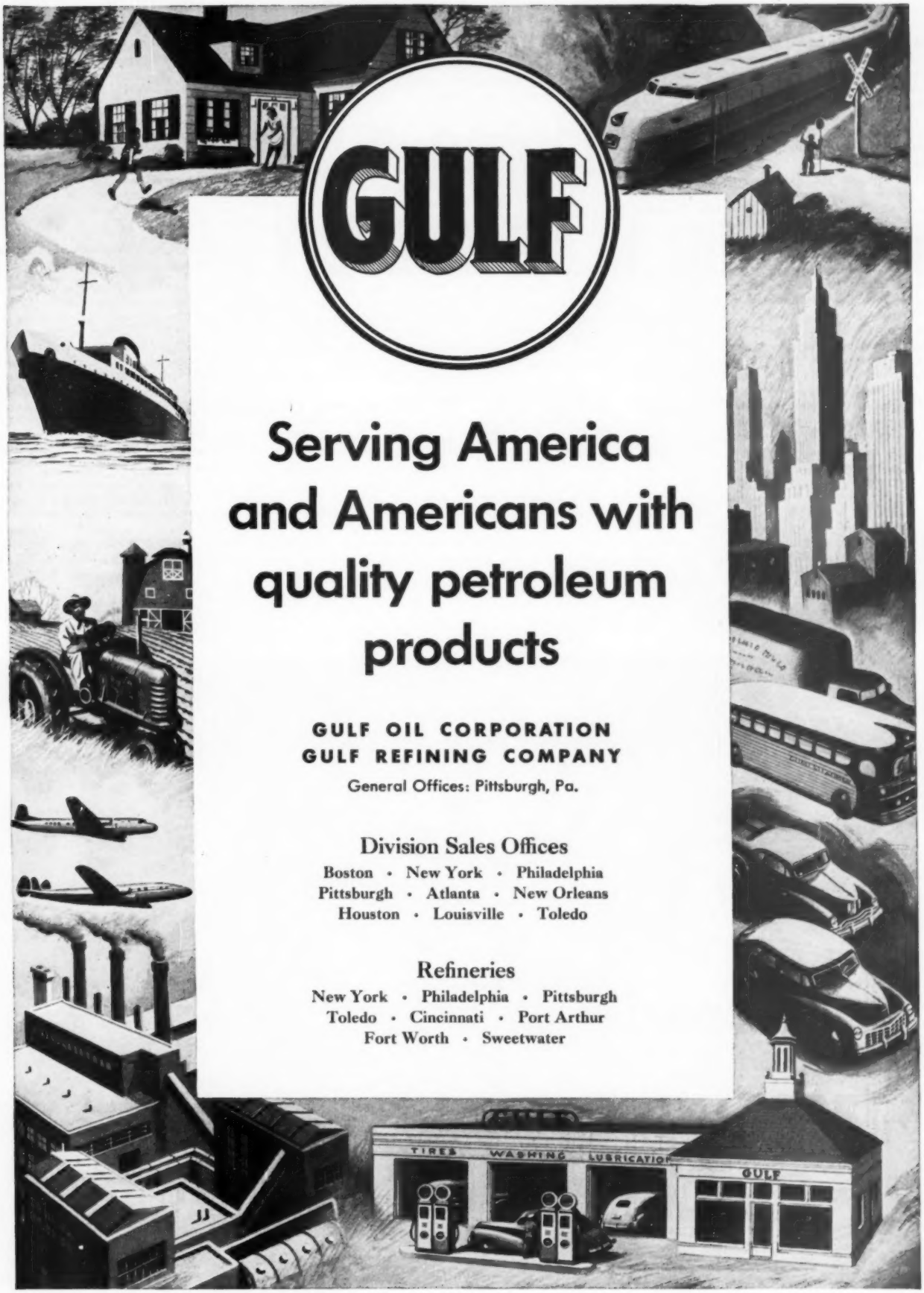
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Cost of Peruvian Development

The Peruvian government has accepted the resignations of the managers of the Empresa Petrolea Fiscal (government petroleum enterprise) and has appointed a committee of the directorate to work out a plan for reorganizing the enterprise as soon as possible.

During the sessions of the 25th anniversary of the Geological Society of Peru in the month of July, there was a thorough discussion of the present position of Peruvian oil. Dr. J. E. Rassmuss presented a paper on the problem of Peruvian geology, and Mr. Bell, chief geologist of the International Petroleum Company, spoke on the economic conditions governing industry development in the Montana. Mr. Bell estimated the necessary investment in the mountain region at about $250 million, which could best be provided by a consortium of companies. The cost of a trans-Andean pipeline from Borja in the Marañon to Bayovar on the Pacific coast, a distance of 600 kilometers, is estimated at $35 to $50 million. The project for this pipeline presumes a daily production of 100,000 barrels, for which there would be required 250 producing wells drilled at a cost of about $25 million. On the other hand a daily production of 100,000 barrels would require development of proved reserves amounting to about 500 million barrels, which would involve an area of about 20,000 hectares of proved territory. The time required for developing the project would be at least 10 years, and the first barrel of oil could not be expected to arrive on the Pacific coast before 1960.

Dr. Rassmuss also stressed the importance of the oil market in the neighboring Atlantic countries, Brazil, Uruguay and Argentina, which are all deficient in petroleum.

The port of Iquitos on the Amazon River, which is accessible to 70,000-barrel tankers coming up from the Atlantic, is the natural outlet for the Ucayali region. The Brazilian government has decided to build a refinery with a daily capacity of 45,000 barrels at Belem at the mouth of the Amazon.

By a decree issued on June 27 the Peruvian government has ordered work to begin at once on the construction of a standard gauge railway from Tambo de Sol to Pucallpa across the Ucayali River, a confluent of the Amazon; this will be the first railway into the mountain district and will be of material assistance in the exploration of that territory.

Diesel Fuel Consumption

Railroads in the United States consumed 30 million barrels of diesel fuel in 1948 according to R. W. Reinhart, manager of market research for Socony-Vacuum Oil Co. In 1949 consumption is expected to increase 36 percent and by 1951 to be double the 1948 level. Diesel locomotives consumed 330,000 barrels of lubricating oils in 1948.

New Type Valve

Tork-Master Company, Inc., has developed the Mac Bain "Positive Shut-Off" valve which is basically a check valve with main and primary seats and discs, worm and gear driven to provide positive control in opening and closing. Torque thus applied enables the valve to open easily against rated pressures with manual control in closing. Temperature ranges are from 40°F below to 300°F above, and pressures up to 150-300 pounds. A side access door allows inspection and reconditioning to be made without removing the valve from the line.

New Tanker Launched

The 18,000-ton Vikland, the largest tanker built on the Clyde, was launched from John Brown's yard, Clydebank, on July 26. Built for the Tanker Corp. of Panama, the huge vessel is painted in pastel shades of grey and green and silver. She is the first of two sister ships being built at Brown's for the same owners. She is 571 feet in length and was constructed on the transverse and longitudinal system of framing; she has nine center and 16 wing tanks with a total capacity of approximately 900,000 cubic feet. Provision is also made for a dry cargo hold forward with a capacity of over 20,000 cubic feet.

Axelson To Manufacture Torque Converter

Axelson Manufacturing Co. has recently acquired an exclusive manufacturing and sales license for the C. M. O'Leary patents on hydro-kinetic torque converter drives, according to J. C. Axelson, president and general manager. The first model, which is rated at a maximum of 600 hp at 900 rpm and a minimum of 350 hp at 800 rpm, is already in the process of manufacture. Future plans call for the converter to be built in four sizes for the petroleum drilling industry.

Wellex Jet Opens Houston Station

The jet method of oil well perforating is now available to operators in the Houston and south Texas area since Welex Jet Services Inc. opened a Houston station on May 8 at 6512 Del Rio St. Cecil Puryear manages the new station. He was formerly station manager of the Welex branch at Wichita Falls. Sales manager of the Houston station will be Kenneth Daggett, who comes from the Welex office in Fort Worth.

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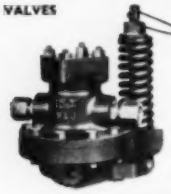

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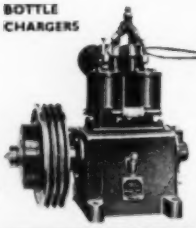

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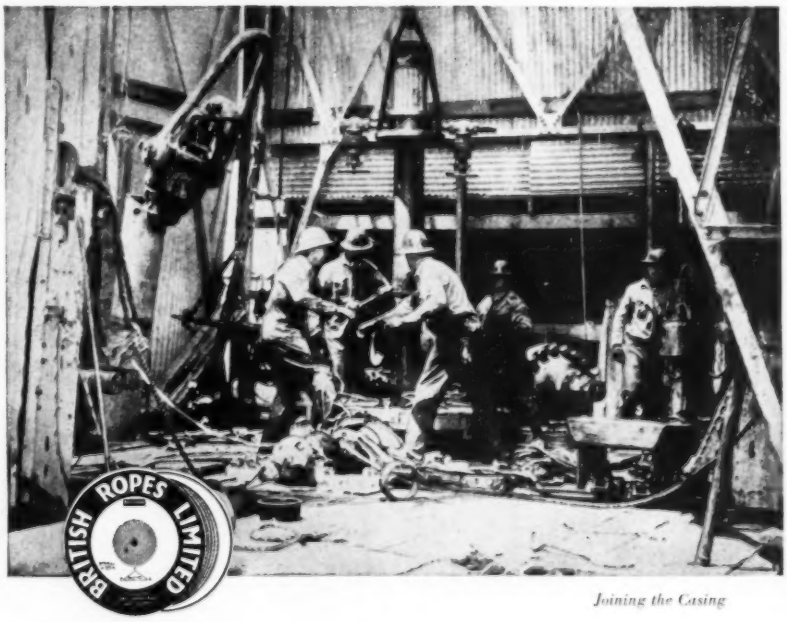

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Dave Meddick

Meddick Joins Petro-Tech

Dave Meddick, formerly chief production engineer with Lane-Wells, technical oil field service firm, has been appointed superintendent of the eastern division for Petro-Tech, according to an announcement made by Keith Miner, vice president of Petro-Tech, the Venezuelan subsidiary of Lane-Wells. Mr. Meddick had been with Lane-Wells in an engineering capacity since 1937. Jim Barnett, former assistant to Mr. Meddick, replaces him as chief production engineer for Lane-Wells.

Portable Exploration Drill

Production has been started on a new model portable exploration drill designed and engineered in America and built at the factory of the Mitchell Engineering Company Ltd. in Peterborough, England. The pilot model is scheduled to be given its first field test in August.

A new company, Failing-Mitchell, has been set up to produce the drill. E. L. Alexander, chief engineer of the George E. Failing Supply Company of Enid, Okla., and George E. Failing, owner of the company, sailed for England late in August to participate in the testing of the new drill.

The British-built drill has a capacity of 2,500 feet with 2⅛-inch drill pipe. It is trailer-mounted and powered by a Leland engine built in Preston, England. The slush pump is of English design and manufacture.

The Failing-Mitchell Company was organized under a Lichtenstein charter. Sales will be handled by the Failing Company's export office in New York.

Texaco Sells New Transmission Lube

The Texas Co. has begun the sale at many of its stations of fluid for automatic transmission units, according to an announcement by Walter Hochuli, general sales manager. The fluid, which has been named Texamatic, has been under development for some years and is approved by General Motors for torque converters and hydramatic transmissions. The fluid is said to be a lubricant, hydraulic control fluid and a heat transfer medium. It is stable from —30 to 300°F and possesses anti-foaming and corrosion preventive properties.

Mr. Hochuli estimates that there will be three million automatic-transmission-equipped cars on the road within 18 months, exclusive of Chrysler's fluid drive. Transmisisons require draining and refilling only once a year, but the prospective market is quite large—1,800,000 gallons for factory fills and five million gallons for servicing in 1950 and a total market of 25 million gallons within five years. By 1960 the demand may be as high as 60 million gallons.

Drilling Ethiopia

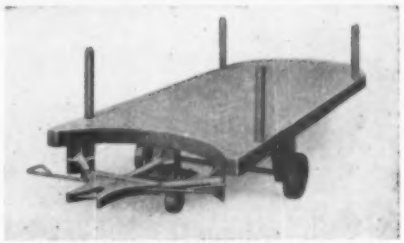
Sinclair Petroleum Company has started drilling the first oil well in Ethiopia, according to cable advices received at the New York headquarters.

After more than three years of exploration and exploitation, a site was selected in the Gumburo Hills district of the province of Ogaden. Drilling equipment was moved in from base headquarters at Dire Dawa, and rig and campsite facilities erected. Wells driven to water bearing sands in the area adjacent to the well-site provide drinking water as well as water for drilling operations.

Open House Manual

A manual containing directions and procedure for holding open house has been prepared for oil companies by the Oil Industry Information Committee. Titled "Holding Open House," the manual will be particularly useful for the companies holding open house during Oil Progress Week, October 16-22, although it tells how to conduct an oil company open house at any time of year. "Holding Open House" has complete suggestions as to the various groups who might be invited to attend and various steps to follow. Copies may be secured through any district office of the Oil Industry Information Committee at a price of $6.50 per hundred copies plus shipping.

Another IRVINGTON JOB



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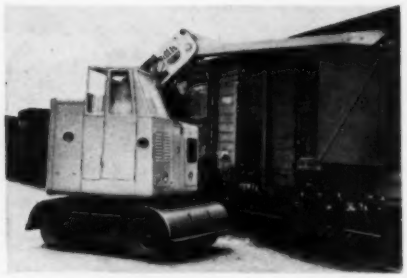

Loading Crane

The searcher jib was primarily designed as a modification of the Coles mobile crane for the handling of merchandise in tight quarters. The photograph illustrates loading into a Great Northern freightcar from ground level. The Coles searcher job, full circle slewing crane, manufactured by Steels Engineering Products Ltd. of Crown Works, Sunderland, England, has an almost uncanny ability to search out remote corners and pick up or put down loads in the most awkward places. It can reach under a door height of six feet, eight inches from ground level and lift one ton up to a height of 14 feet, or half a ton at a 12-foot radius from the center post.

Midstates Oil Corp., a subsidiary of Middle States Petroleum Corp., has elected three new vice presidents; Philip C. Dixon of Houston, Texas, becomes the executive vice president, and George M. Vandaveer Jr. and W. H. Blackburn, both of Tulsa, become vice presidents. The new officers will all be headquartered in Tulsa.

Mr. Dixon is widely recognized as an authority on pressure maintenance and cycling operations. Mr. Vandaveer will be in charge of production and engineering. He has been with the company since 1940. Mr. Blackburn has been associated with Midstates in managerial capacities since 1919, working closely with N. T. Gilbert of Tulsa, former executive vice president who died recently. Joseph Glass of New York continues as president and Frank H. Harrell of Shreveport, La., continues as senior vice president.

New West Texas Pipeline

An $18 million pipeline from west Texas to the Gulf Coast will be started by Humble Pipe Line Co. toward the end of 1949 and completed around the middle of 1950. The new line will be of 18-inch pipe, extending 375 miles in a direct route from Kemper in Reagan County to Satsuma, 20 miles north of Houston, where it will connect with Humble's existing lines to Baytown. The line will have an initial capacity of 95,000 barrels per day with one intermediate station between Kemper and Satsuma. The capacity can be increased to 120,000 barrels per day by the addition of a second intermediate station.

Oil Tanker Averts Water Famine

East London, South African coastal city of 77,000 population, over 250 miles by sea from Durban, is being saved from drought and disaster by the transport of 40,000,000 gallons of fresh water in a new oil tanker, the "Athel Crown," now on her maiden voyage. But for the offer of this tanker, now on charter to the Shell Company, which, in agreement with the owners, Athel Line Ltd., is diverting it from service in the Persian Gulf area before loading its first oil cargo, all industry in East London would have been brought to a standstill and mass evacuation would have been necessary. The "Athel Crown" was to load her first cargo of 3,350,000 gallons in Durban late in July, that city having undertaken to supply up to 5,000,000 gallons of water a week, and to reach East London by August 1.

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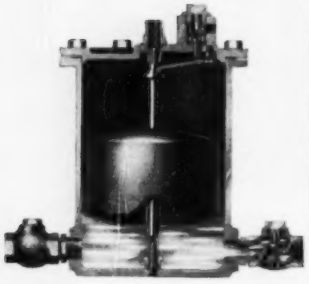

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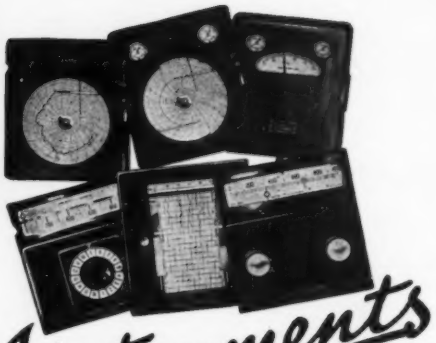

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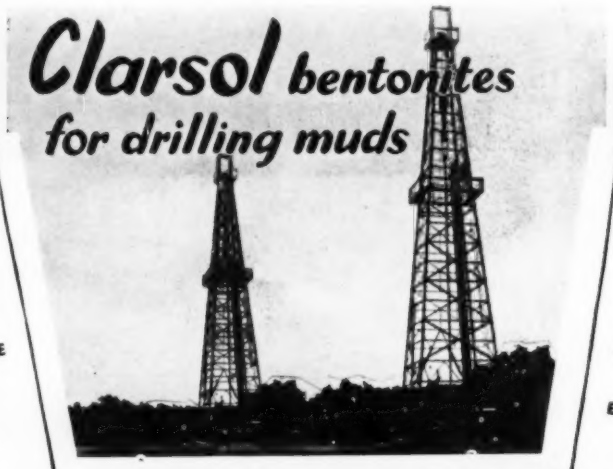

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New Books

The First Scientific Analysis of Petroleum, published by Paul H. Giddens, Allegheny College, Meadville, Pa.; 24 pages, $1.25.

This pamphlet is a facsimile reprinting of Prof. Benjamin Silliman's famous report on rock oil, or petroleum, in Vanango County, Ga., Silliman's report printed in 1855, gave the New York promoters, Bissel and Evelett, a base from which they successfully floated the world's first oil company and gave the job of drilling the first oil well to Col. Drake in 1859.

This reprint is issued in connection with the 90th anniversary of the petroleum industry. Present day readers have an opportunity to marvel at the experimental skill and practical insight by which the Yale professor demonstrated the value of this unprepossessing natural product and inspired investors of that day with confidence in its future.

Petroleum Refinery Engineering by W. L. Nelson, professor of petroleum refining, University of Tulsa; published 1949 by McGraw-Hill Book Co., New York; 830 pp.; $9.00.

The new third edition of this standard work has been entirely rewritten to accommodate numerous details that have grown upon the oil refining industry in the last few years. Less attention is given to basic chemical engineering which is now exhaustively treated in other available works. The outstanding developments during the second world war—alkylation, isomerization and butane dehydrogenation—are somewhat lightly touched, as at the present time they do not fit into competitive mass production, but the major technical heritage of this period—the catalytic cracking process—receives its proper due.

The subject matter is presented in 25 chapters which cover the various phases of oil refining: economics of design; petroleum products and test methods; refining and distillation processes; chemical treatments; thermal and catalytic cracking; auxiliary processes and operations; fluid mechanics; heat transfer, etc. It is a useful and good book for students and practicing oil technologists.

Subsurface Geological Methods; a symposium compiled and edited by L. W. LeRoy and Harry M. Crain. Published 1949 by Colorado School of Mines; 826 pages, 436 figures and 12 plates; paper $6; Fabrikoid $7.

This book is distinguished by the fact that it includes, in one source, a detailed discussion of methods and criteria of subsurface geological exploration and reservoir characterization. The text is divided into 43 major topics which are discussed by specialists in the various fields, as follows:

Stratigraphic, structural and correlation considerations; micropaleontologic analysis; detrital mineralogy; insoluble residues; thin-section analysis; shape analysis; petrofabric analysis; screen analysis; settling analysis; stain analysis; porosity and permeability analysis; electron-microscopic analysis; water analysis; x-ray analysis; core analysis; multiple-differential thermoanalysis; lithologic logging; electric logging; induction logging and application to logging of wells drilled with oil-base mud; radioactivity well logging; caliper and temperature logging; well logging and drilling-mud and cuttings analysis; spectrochemical sample logging; drilling-time logging; fluoroanalysis; driller's logging; composite-cuttings analysis logging; controlled directional drilling; oil-well surveying; magnetic core orientation; oriented cores, dipmeter surveys; coring techniques and applications; design and application of rock bits; deep-well camera; the electric pilot in selective acidizing, permeability determinations and water locating; character of pores in oil sand; subsurface graphic representations; subsurface maps and illustrations; reports on subsurface geology; subsurface methods as applied in geophysics; subsurface methods as applied in mining geology; and geologic techniques in civil engineering.

Oil! Titan of the Southwest, by Carl Coke Rister, with introduction by E. de Golyer; published 1949 by University of Oklahoma Press; 467 pages, $5.00.

There have been many books written in attempts to recapture the romance, glamor and thrill of the early history of petroleum in the United States, and most of them have been concerned more with thrill than perspective. The author of this book is a professor of history in the University of Oklahoma. Between 1934 and 1949 he has produced ten books about the great American frontier, particularly the southwest. With this background and with the aid of a grant from the Standard Oil Company of New Jersey and a leave of absence from teaching, he has now produced this history of the oil industry in Arkansas, Kansas, Louisiana, New Mexico and Texas. To get his materials he traveled more than 35,000 miles, combed the contents of 27 libraries, examined the files of oil companies and associations, dug through back numbers of trade journals and newspapers, collected letters written by old-timers and hunted down out-of-print publications. Out of this material he has produced a book crammed with facts enough to require an index of 26 pages.

But let no one make the mistake of regarding this book as a dry-as-dust history. It is real history by an historian who, unlike many others, has the rare gift of infusing facts with life. Under his skillful touch the old scenes again appear before you in authentic colors the stubborn courage of the early wildcatters, the dismal failures and fabulous successes, the roar and bustle of mushrooming oil towns, the reactions of free Americans in pursuit of fortune that can be won only by bold initiative and sustained effort.

An account is given of all the major fields, the personalities that figured in their discovery and development, and their relation to the general petroleum picture. When Professor Rister gets through with an oil field, you see it as a whole. His treatment of the East Texas field is especially interesting and valuable because out of this field has come the experience that gave the American oil economy its two cornerstones—conservation and proration.

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